ARCHAEOLOGICAL INVESTIGATIONS OF UNMARKED GRAVES AT EASTERN STATE HOSPITAL LEXINGTON, FAYETTE COUNTY, KENTUCKY

By
Amy C. Favret

With contributions by Sarah Miller and Nancy O'Malley

Kentucky Archaeological Survey
Jointly Administered By:
University of Kentucky
Kentucky Heritage Council
KAS Report No. 119

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Report Prepared For:
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Principal Investigator

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ABSTRACT

During June of 2005, archaeologists from the Kentucky Archaeological Survey excavated 11 graves at Eastern State Hospital in Lexington, Kentucky. Ten of the individuals documented at the Eastern State Hospital site (15Fa219) were buried in one large grave shaft. The eleventh was buried in a single grave shaft that predates the mass burial pit. Based on a review of archival records and analysis of the cultural materials recovered, these burials date from ca. 1839 to 1861. The mass grave could represent individuals who died within a few days of each other, perhaps from an outbreak of cholera or another infectious disease. It is also possible that they died over the course of a couple of months during the winter and were not buried until the ground thawed out in the spring. Analysis of the human skeletal remains indicated that the inmates of Eastern State Hospital led lives that involved a great deal of physical labor. Dental analysis revealed a population that suffered from a high number of caries as a result of consuming a diet high in cariogenic foods that included sugars and sticky, starchy foods and experienced a great deal of nutritional stress as young children.

ACKNOWLEDGEMENTS

This project could not have been accomplished without the assistance of several people. Among them is the field crew: Eric Schlarb, Sarah Miller, Greg Maggard, Edward Henry, A. Gwynn Henderson, George Crothers, Anne Moore, and Chris Moore. Sarah Miller and Eric Schlarb. David Pollack provided greatly appreciated editorial assistance for the entire report, and eter Killoran provided constructive editorial assistance of the skeletal and dental analysis chapters. Orlie B. Wright of Eastern State Hospital provided information for the historical background chapter. Marc Avery and Facilities Support Services greatly assisted with removal of the sidewalk, roadway, and overburden soil, as well as backfilling of the trench. Paul Ramey and Andrea Beolhauf prepared the line drawings and maps, and David McBride took photographs. George Crothers provided laboratory and storage space within the William S. Webb Museum of Anthropology. Ed Winkle and Barbara Gortman handled all of the administrative details for the project.

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INTRODUCTION

At the request of the Mr. Marc Avery of the Finance and Administration Cabinet's Division of Engineering and Contract Administration the Kentucky Archaeology Survey (KAS) conducted an archaeological investigation of the Eastern State Hospital site (15Fa289), Lexington, Kentucky (Figures 1 and 2). This work was undertaken following the discovery of human remains during the excavation of a trench for a new waterline. Upon finding human remains in the backdirt pile, construction workers immediately stopped work and contacted state officials, who in turn contacted Dr. Gary Ginn, the Fayette County Coroner, and the Kentucky Heritage Council. With the determination that the remains did not represent a recent death, but rather a potentially significant archaeological site, the decision was made to have the burials excavated by professional archaeologists. Fieldwork was initiated on the seventh of June, 2005 and completed on the eighteenth of June, 2005. The archaeological field crew, consisted of Eric Schlarb, Edward Henry, Greg Maggard, Amy Favret, A. Gwynn Henderson, Sarah Miller, George Crothers, Anne Moore, and Chris Moore.

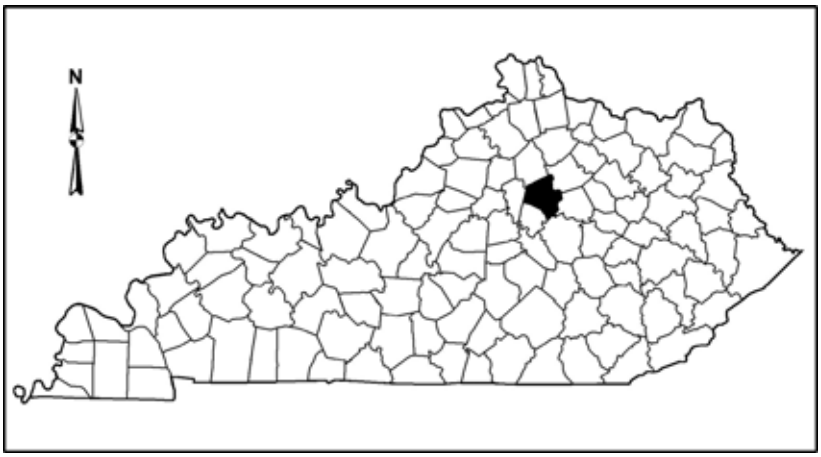

Figure 1. Map of Kentucky Showing Location of Fayette County.

A total of 11 burials was documented during the course of this project. Of these, 10 had been interred in a mass burial pit (Figure 3). The remaining individual had been placed in a separate grave pit that predated the mass grave. Based on a review of archival records and old maps, coupled with the analysis of the artifacts recovered in association with the burials and the type of coffin they were interred in, these individuals were most likely buried sometime between 1839 and 1860. The mass grave could represent individuals who died within a few days of each other, perhaps from an outbreak of cholera or another infectious disease. It is also possible that they died over the course of a couple of months during the winter and were not buried until the ground thawed out in the spring.

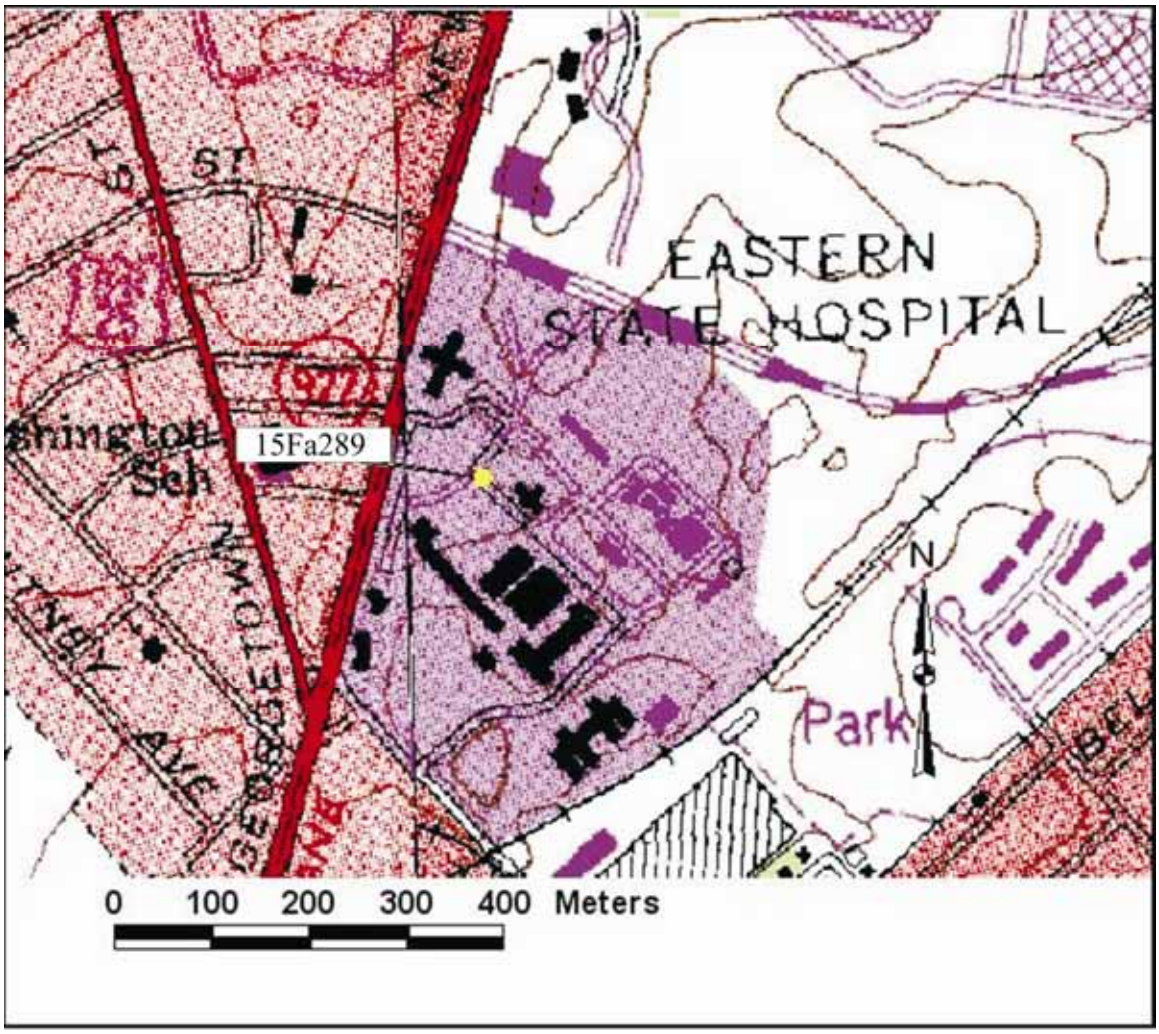

Figure 2. Location of Site 15Fa289 on the Lexington East and Lexington West U.S.G.S. Topographic Quadrangle Maps (Revised 1993).

All of the recovered individuals are adults, and there is an almost even distribution of men and women. Enlarged muscle attachments and woven bone deposition on the skeletal remains indicates this group experienced a labor filled life that involved a great deal of kneeling. Analyses of dental remains show typical wear and caries for a nineteenth-century population. The presence of a large number of enamel hypoplasis points to nutritional stress before the age of 4 years old. Most of the individuals from Eastern State Hospital had bowed longbones, suggesting they suffered from vitamin deficiencies resulting in diseases, such as rickets.

This report provides historical background information on Eastern State Hospital; briefly describes the archaeological methods used to recover the human remains; presents the results of the coffin hardware, personal artifact, and skeletal analysis; and describes the burials founds. All field notes, select artifacts, and records, including the site form will be curated at the William S. Webb Museum of Anthropology at the University of

Kentucky, in Lexington. The human remains will be reinterred at the Eastern State Hospital cemetery.

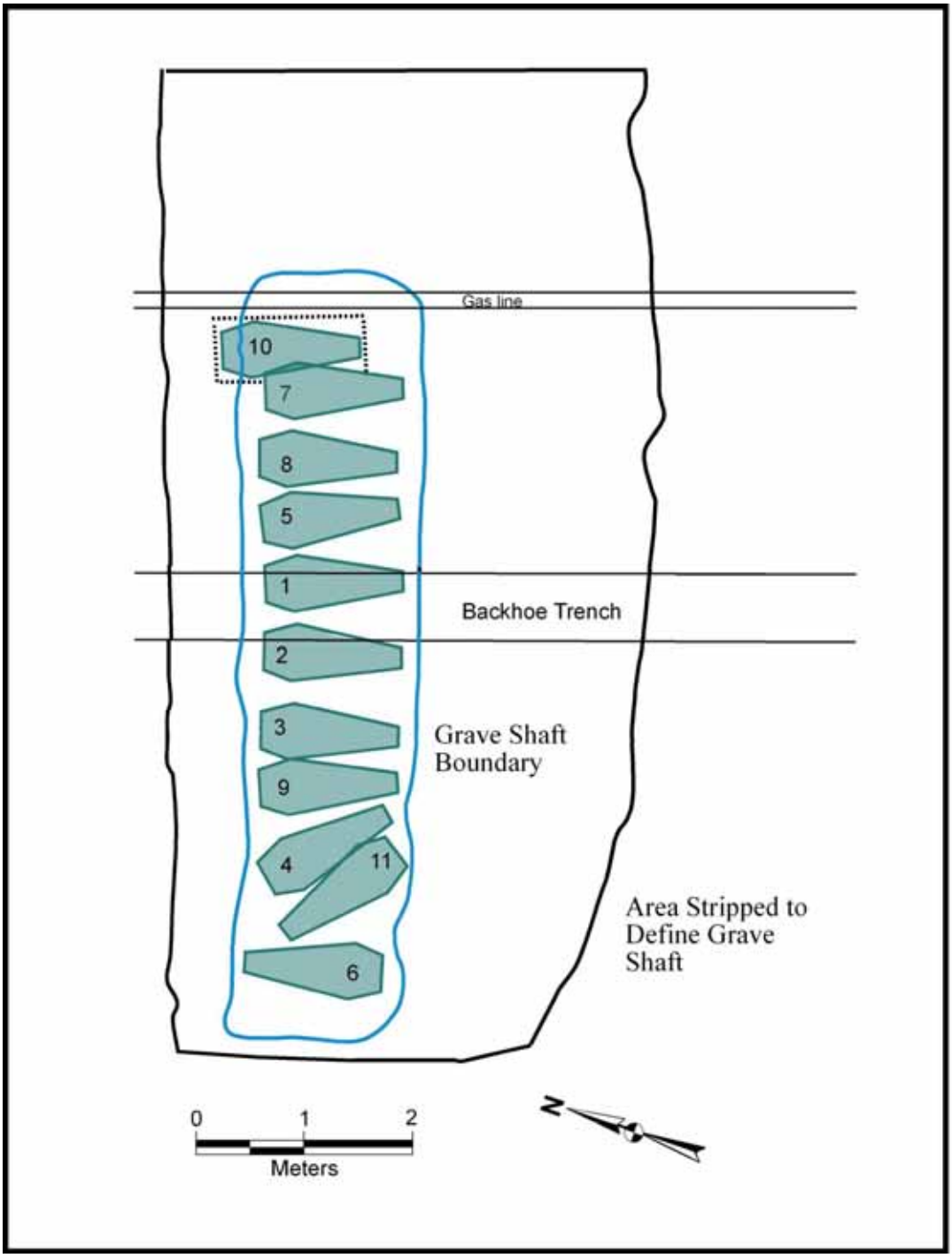

Figure 3. Eastern State Hospital Burials, Site Map.

HISTORICAL BACKGROUND

By
Nancy O'Malley

Eastern State Hospital, known historically as Eastern State Lunatic Asylum or Eastern Kentucky Lunatic Asylum, was officially established in 1824. It was the first institution for the mentally ill or handicapped west of the Appalachians and the second in the entire United States. The asylum found a home in the unfinished three-story building that had been intended to house the Fayette Hospital. Founded in 1816 to treat the pauper sick, the hospital never opened because of the Panic of 1819 (White 1984:26). Prior to the establishment of a lunatic asylum, mentally ill and handicapped people were kept at home or housed in county facilities funded by the state. Governor Adair conducted a review of the state's mental health policy in 1820 and concluded that the expenditures to the counties had steadily increased. He recommended the establishment of a centralized facility to house and treat the mentally ill. The governor stressed the economic and philanthropic benefits, but also suggested that establishing an asylum in Lexington would benefit the Transylvania Medical School. A Senate Investigative Committee was formed to assess the possibility of taking over the Fayette Hospital property and converting it to an asylum.

The hospital building, located on West 4th Street, stood three stories, had a large cellar, and measured 66 feet by 63 feet 4 inches. The property attached to the building amounted to 10 acres and included a good freshwater spring. The committee estimated that the building, when finished, could accommodate 60 or 70 individuals with the necessary attendants. Local physicians and medical faculty at Transylvania College endorsed the project and offered their support and services. The Committee returned a favorable report and the asylum opened in 1824 under the supervision of a local board of trustees or commissioners appointed by the Governor (White 1984).

Initially, the asylum made a distinction between 'lunatics of unsound mind,' particularly those who posed a danger to themselves, their families, or their community and those who were sick or imbecile. The distinction would not last, and soon the asylum became home to individuals with congenital mental handicaps (termed "idiots" or "imbeciles" in the language of the day), as well as those who developed mental illnesses. Epileptics also were frequently admitted. Although the Governor had criticized the county level system of caring for the mentally ill and intended the Lexington asylum to replace this system, the legislature reinstated the policy of funding facilities at the county level. The retention of this policy created the unique and unfortunate situation in which the asylum became the institution of last resort for people who had become unmanageable and essentially incurable.

Nonetheless, the association of the Transylvania Medical College with the Asylum fostered programs of treatment intended to cure people of their mental afflictions. These programs changed over time as different theories were promulgated and practiced by the medical community. The earliest treatment program was based on the

beliefs of Benjamin Rush who taught that the brain became diseased because of inflammation (White 1884). Bloodletting was the standard treatment for this condition along with other depletive prescriptions, such as emetics and purgatives. Rush also advocated confinement in total darkness and physical restraint in strait jackets or other devices that today would be considered forms of torture. Rush and his students recognized both moral and physical causes of mental illness. Moral causes derived from the "passions," which were subdivided into stimulant passions (hope, joy, love, courage, ambition, and anger) and sedative passions (fear, grief, despair, jealousy, hatred, envy, and remorse) (White 1984). The sedative passions and anger were thought to be the chief culprits in the development of mental illness through moral causes.

Physical cause was recognized as organic dysfunction within the brain. Specific conditions that could lead to mental problems, included intoxication, inordinate venereal indulgence, worms in the alimentary canal, head injuries, syphilis, improper use of mercury, pregnancy, parturition, gastric problems, and narcotic poisoning.

The public perception of the asylum in its early years was that it was an exemplary institution, but insiders knew that the institution had many problems. A persistent difficulty was the inadequacy of the old Fayette Hospital building (White 1984). The building as constructed was not big enough to hold everyone associated with the asylum and the inmate cells built on the third floor were heated by a single fireplace. Additionally, the violent patients could not be easily segregated from the more manageable inmates (White 1984).

Early in the asylum's history, construction of additional buildings and improvement of the physical plant of the asylum site were urged and several projects were completed. The asylum's landholdings also increased slowly. The original 10 acres on which the Asylum stood was located on Fourth Street where it joined a street that was first known as Henry's Mill Road and later Newtown Road (Fayette Deed Book W:158). The main driveway leading into the asylum was first on Fourth Street; the orientation shifted to Newtown Road when the administration buildings were replaced, enlarged, and modified. However, the Fourth Street entrance is still in use and appears to be in the same location as originally laid out.

Major construction projects in the 1830s, included a two-story (400 ft^2) building with 16 rooms for the violently insane, a smokehouse, a springhouse, a pump and cistern, a wash house, two privies, and a brick boundary fence (White 1984). In 1839, two tracts of land, totaling just over seven acres, were added to the property (Fayette Deed Book 16:164, 263) (Figure 4). These tracts, which were attached to the rear of the original 10 acres, extended the property's boundaries to the northeast. In 1840, a three-story building was constructed for contagious inmates. This building also was used to store bedding straw and to stable horses and cattle. In 1842, two more tracts totaling just over nine acres was added (Fayette Deed Book 20:184, 330). In 1843, a stone vault was built to hold the bodies of inmates that died during the winter when graves could not be dug. This was a temporary holding area used until burial could take place. In 1852, the older Fayette Hospital building was severely damaged by fire. In 1854, another land acquisition

extended the asylum property along Henry's Mill Turnpike (later Newtown Road) (Fayette Deed Book 29:398). By 1855, the asylum property amounted to about 40 acres (Figure 5). Through the 1860s, land acquisition and building construction continued to expand and transform the asylum property (Fayette Deed Book 37:274, 43:511, 44:346).

Figure 4. Deeds Relative to Location of Mass Grave (Note relationship of mass grave to the northern corner of 1839 addition and northeastern corner of 1854 addition).

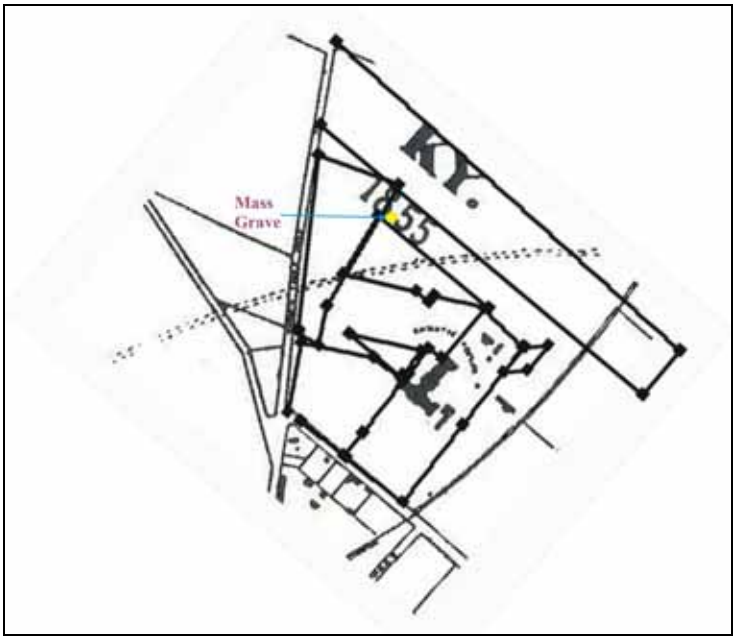

Figure 5. Haag and Sons (1855) Map of Lexington Showing Lunatic Asylum (Note Location of Mass Grave and Property boundaries).

A map, drawn in 1871, shows the asylum property in detail (Ehrgott & Krebs Lith., Cincinnati) (see front cover). The bulk of the administrative buildings, inmate dormitories, and service buildings are located on the south end of the property where the earliest land acquisitions were located. The inmate population increased steadily through the nineteenth century, and the low rate of cure resulted in a large number of inmates spending many years there. Throughout this period the death rate fluctuated but remained high compared to the general population. When an inmate died, the remains were either claimed by the family for burial elsewhere or buried on the asylum grounds. The asylum cemetery, established in 1861, was located at a considerable distance from the main building complex on property that was not part of the original 10 acres, but probably was acquired no later than 1854 and perhaps as early as 1839. An 1887 map of the property shows the buildings, but not the cemetery (Figure 6) Over 4,000 burials from this cemetery were disinterred and reburied in the northeast corner of the current asylum property in the 1980s.

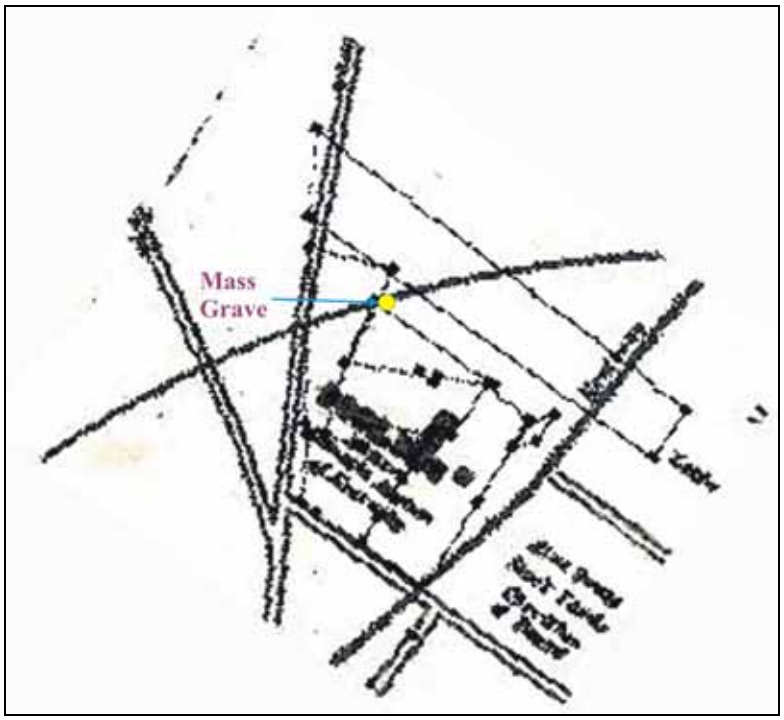

Figure 6. John Lethem (1887) Map of Lexington, Showing Eastern Lunatic Asylum (Note Location of Mass Grave and Property boundaries).

The burials discovered during the construction of a waterline were situated beneath a paved road that runs in a northerly direction toward the north side of the hospital property. By 1861 this location appears to have been "pleasure grounds" for female inmates (Figure 7). A reconstructed plat of the various land acquisitions of the asylum indicates that the burial location was on or near the boundary line between an 1839 deed and a larger parcel acquired in 1854 (Figure 4). Placement of the land tracts is somewhat problematical because of the quality of nineteenth-century surveys, and there

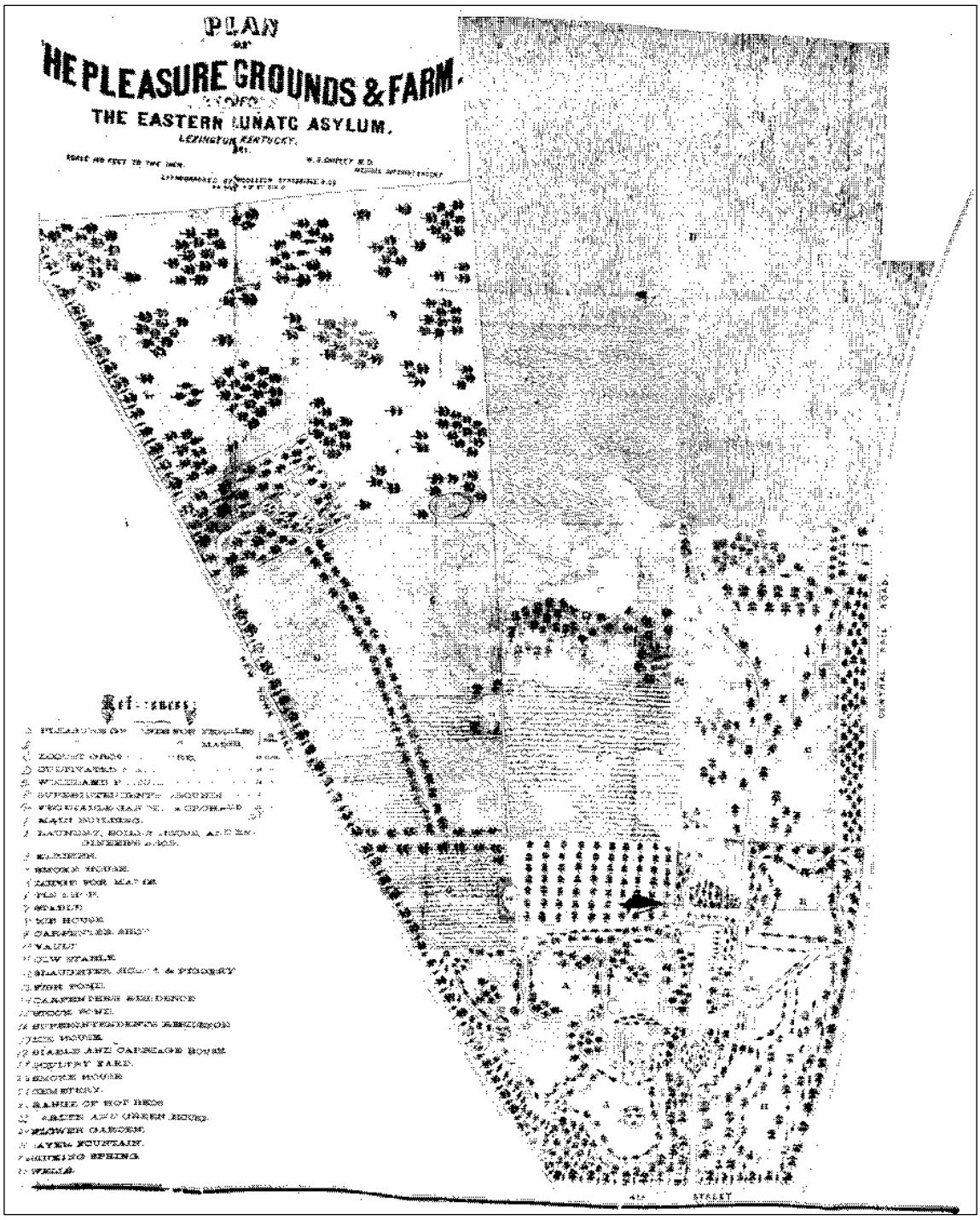

Figure 7. Middleton, Strobridge & Company (1861) Birdseye View of Pleasure Grounds and Farm of Eastern Lunatic Asylum.

is an unexplained gap that may be due to surveying errors or some other cause; nevertheless, the burial location is clearly outside of the original 10 acres that was the asylum's original land. Thus, map and deed evidence suggest that the burial took place no earlier than the acquisition of the 1839 tracts and no later than the 1861 use of the area where the burials were found as the female "pleasure grounds." During this time range the death rate at Eastern State Hospital exceeded 10 every year except for 1844 (n=8), 1845 (n=10), 1859 (n=9), and 1860 (n=0). Perhaps more significantly, a Cholera epidemic struck Lexington and the asylum in 1849-1850. Within this two year period 215 inmates died (White 1984). The death rate was also unusually high in 1856 with 65 individuals died at the asylum (White 1984:62). Based on this information it is possible that the mass burial represents 10 individuals who died during an outbreak of Cholera, or some other infectious disease. For instance, a form of dysentery haunted the asylum until 1856 when the cause, sewage flowing into the asylum's source of drinking water, was finally discovered and alleviated. Alternatively, the individuals in the multiple grave might have died during the winter when the ground was too frozen to excavate graves, with the bodies being stored in the 1843 stone vault that was built for to house such remains.

As will be discussed in the following section, the association of post-1840 Prosser buttons with some of the burials lends support to the suggestion that the individuals interred in the mass burial died sometime after 1839. Likewise, the absence of four-sided coffins indicates that these individuals were interred before 1860. The multiple burials placed in a common pit suggest either a situation in which numerous inmates died within a limited time period or the burial of individuals who died during the winter and were not buried until the ground thawed out. In either case, the 10 burials interred in the mass grave were placed in the ground at the same time.

FIELD METHODS

Following the discovery of human remains in a waterline trench at Eastern State Hospital, the backdirt from this trench was carefully screened through 6.35 mm mesh. All human remains and associated artifacts (e.g., coffin nails) were collected, bagged, and assigned a field specimen number. The next step was to define the limits of the grave shaft(s) associated with the two burials that had been impacted by the backhoe trench. The first step in the process was to use a backhoe to remove 1.5 m of overburden and some of the grave shaft fill. As the work progressed it quickly became apparent that these two burials were not interred in individual grave shafts, but had been placed in one large grave shaft, that measured 1.5 x 7 m (Figure 3) and contained eight other individuals. Once the limits of the mass grave shaft were defined, it was photographed and drawn in planview.

After the size and shape of the grave shaft had been defined, shovels and trowels were used to remove the remaining grave shaft fill. The first step in this process was to expose the outline of each coffin. The human remains and associated artifacts were then carefully exposed by hand using brushes and bamboo or wooden tools. The exposed remains and artifacts were photographed, mapped, and longbone measurements were taken and skeletal observations were made by a physical anthropologist. The human remains and associated artifacts were then carefully removed. All of the recovered human remains and artifacts were collected, bagged, and assigned a field specimen number. The same methodology was used to document the single interment that predated the mass burial (Figure 3).

All materials recovered, including both skeletal and cultural, from the Eastern State Hospital were washed, analyzed, and catalogued at the University of Kentucky Archaeology Laboratory. A site form was completed for this small cemetery. The human remains will be reinterred within the Eastern State Hospital Cemetery in the winter of 2006.

CULTURAL MATERIALS RECOVERED

By
Sarah E. Miller

Of the 401 historic artifacts recovered from Eastern State Hospital, most were classified as coffin hardware (n=369), with the remainder consisting of personal (n=17) or nonmortuary related (n=15) artifacts (Table 1). Artifacts classified as coffin hardware consisted almost entirely of nails. Among the personal materials found in association with the 11 excavated burials were buttons (n=16) and an iron buckle. Nonmortuary artifacts consisted of ceramic sherds (n=3), a fragment of container glass, and window glass fragments (n=11) recovered from the grave shaft fill. Artifacts with unknown provenience, such as historic artifacts recovered from the backhoe trench spoil pile, were not included in this analysis. After assignment to a function group, all artifacts were counted, and in some cases measured and drawn. Coffin shape also is discussed in this section. A button typology was created for this assemblage to better describe and interpret the assemblage.

COFFIN HARDWARE

Eleven separate coffins were documented, ten in a single large burial shaft and one in a separate and deeper shaft. The term coffin refers to a six-sided, or hexagonal, burial case. It is generally thought that hexagonal coffins were the norm in America up to the mid-nineteenth century, when they were replaced by four-sided coffins (Habenstein and Lamers 1955). All are presumed to have been constructed of wood, although all of the wood had completely deteriorated. Cut nails comprised nearly all of the coffin hardware category (n=360) (Table 1). The only other materials assigned to this category were nine nondiagnostic fragments of cast iron. They may have been from a name plate, or an unidentified artifact that was mixed in the grave shaft fill.

Nails

Nearly all of the hardware consisted of late machine-cut nails (n=360) that were manufactured and widely used from 1830 to 1880 (Nelson 1968). Though no bent or clinched nails were recovered, several crossed cut nails were identified in this assemblage. The latter were likely used on the corners of the wooden coffins where the edges met (Figure 8). The wood has rotted away and the nails have concreted together.

Pennyweight sizes were determined for the whole nails (n=158), with almost all being assigned to the 7d and 10d pennyweight classes (Table 2). The smallest nails found were classified as 4d. One was found with Burial 10 and six were used in the construction of the coffin for Burial 2. Though a larger number of nails were used to construct the Burial 10's coffin than the other coffins, in general similar types of nails were used to construct all of the coffins.

Table 1. Inventory of Artifacts.

	Burial 1	Burial 2	Burial 3	Burial 4	Burial 5	Burial 6	Burial 7	Burial 8	Burial 9	Burial 10	Burial 11
Hardware											
Flat Iron Fragments									9		
Nail, Cut	5	33	41	28	28	42	31	24	37	60	31
Personal											
Buckle										1	
Button, Bone								3		7	
Button, Prosser			1			2					3
Miscellaneous											
Ceramic				2							1
Container Glass								1			
Window Glass				1	1		5	1	2		1
Total	**5**	**33**	**42**	**31**	**29**	**44**	**36**	**29**	**48**	**68**	**36**

Table 2. Pennyweights for Whole Nails from Eastern State Hospital.

Pennyweight	Late Cut
4d	7
7d	97
8d	1
9d	1
10d	52
Total	**158**

Figure 8. Crossed Nails: left, late machine-cut 7d nail; right, late machine-cut 10d nail.

Though pennyweight sizes have been used to infer shape and construction of historic structures, to date there has been little or no interpretation of the range of pennyweight sizes recovered from historic cemeteries. It is possible that the recovery of a variety of nail sizes reflects a coffin maker's use of whatever was available to construct a coffin, which could indicate that the person interred within that coffin was of a lower socioeconomic status. Alternatively, it could indicate specialized use of different size nails for different parts of coffin construction. On the other hand, if certain pairings of pennyweight sizes, such as 3d and 7d nails, were preferred by some craftsmen, the identification of such pairs could point to more specialized coffin construction. Architecturally, a 10d nail is considered a medium construction nail (6d-16d), used for a variety of purposes, unlike small construction nails (2d-5d), which are used in the final stages of carpentry (Buckles 1978:403-404). The predominance of 7d and 10d nails in Eastern State Hospital assemblage may indicate the presence of an on-site workshop.

The pennyweight data from the Eastern State Hospital site is fairly uniform when compared to other regional cemetery nail assemblages, such as those from the Old Frankfort Cemetery (15Fr154) (Miller 2007). Nails from the Old Frankfort Cemetery

were concentrated around the coupling of 7-8d nails, and 3-4d, with the former accounting for 40.4 percent and the latter 25.2 percent of the nails (Table 3). At the Old Frankfort Cemetery the use of smaller construction nails suggests that the coffins and caskets may have been made by local cabinet makers.

Table 3. Pennyweights for Whole Nails from the Old Frankfort Cemetery.

Pennyweight	Wrought	Late Cut	Square/ Unidentified	TOTAL
>2d		22		**22**
2d		82	6	**88**
3d		213	13	**226**
4d		182	2	**184**
5d	1	123	3	**127**
6d	1	95	1	**97**
7d	2	354	9	**365**
8d	28	247	18	**293**
9d	1	135	1	**137**
10d		55	1	**56**
12d		30	2	**32**
16d		3		**3**
Total	**33**	**1541**	**56**	**1630**

PERSONAL ARTIFACTS

Buckle

A cast iron buckle was recovered from Burial 10. It was found at the waist of a 50-59 year-old female. Its placement suggests the woman was wearing a skirt or a belt. The buckle was fragmented and heavily concreted. Due to the condition of the buckle, no further identification was possible.

Buttons

In general, the buttons recovered from Eastern State Hospital represent simple mass produced types commonly used during the early to mid-nineteenth century (South 1964:122) (Table 4). The absence of shell, fabric, or horn buttons may be due to preservation conditions. On the other hand the absence of vulcanized rubber buttons may indicate the burials predate these types of buttons, which were marketed in the 1850s.

Buttons were recovered from six of the 11 burials, with almost half of the buttons being associated with Burial 10. Most of the buttons were associated with females, with buttons being found with four of the six females, but only one of the five males. A button typology was created to facilitate the description of the recovered buttons and to aid inter-burial comparisons. The 16 recovered buttons were sorted into five types based on material, shape, manufacture, and decoration (Figure 9).

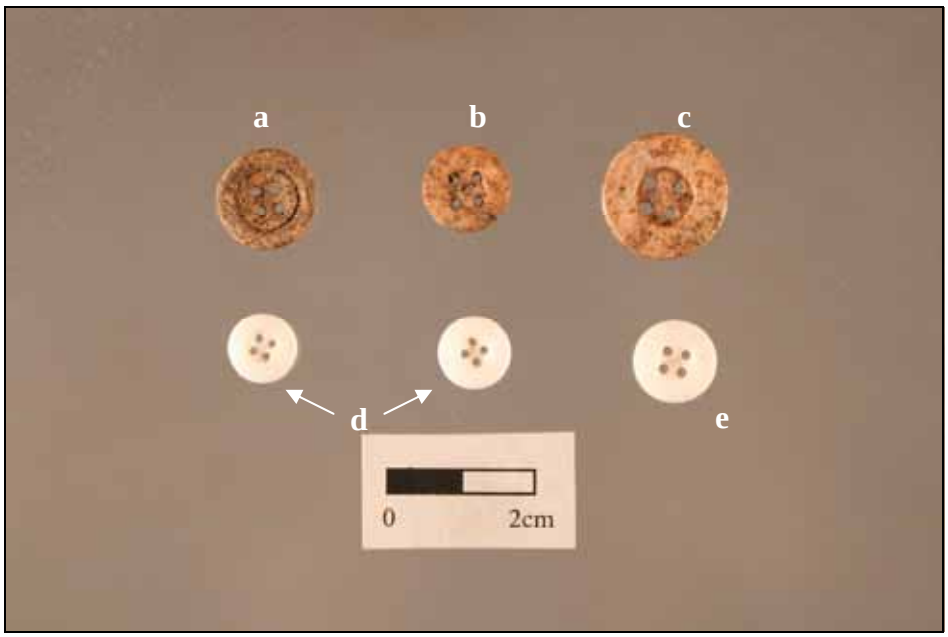

Figure 9. Button Types 1 through 5: a, Type 1; b, Type 2; c, Type 3; d, Type 4; e, Type 5

Table 4. Buttons from Eastern State Hospital.

Type	N=	Material	Shape/Features/Manufacture	Provenience
1	3	Bone	Four-holed small	Burial 8
2	4	Bone	Five-holed small	Burial 10
3	3	Bone	Four-holed large	Burial 10
4	2	Porcelain	Four-holed small	Burial 6
5	4	Porcelain	Four-holed large	Burial 3 (n=1), Burial 11 (n=3)

Table 5. Burials (N=5) Containing Buttons.

	Number of Burials with Buttons (N=5)	Number of Buttons to a Burial (N=16)	Number of Types to a Burial (N=5)
Age			
Adult (unspecified)	1	2	1
Middle Adult (40-50)	1	3	1
Middle Adult (50-59)	1	7	2
Old Adult (60+)	2	4	2
Sex			
Female	4	14	4
Male	1	2	1
Biological Affinity			
Caucasian	5	16	5

Type 1

Button Type 1 is a four-holed bone button with an incised concentric groove for decoration (Figure 9a). Type 1 buttons (n=3) have a mean diameter of 12.6 mm. All were recovered from Burial 8. These buttons were found in a line down the spinal column indicating the deceased was likely wearing a button-up shirt. Bone buttons were the most common utilitarian button during the nineteenth century (Hughes and Lester 1981:8). In an attempt to imitate eighteenth-century ivory buttons, less expensive buttons were made from animal bones (Fink and Ditzler 1993:52).

Type 2

Button Type 2 is a small five-holed bone button. The four Type 2 buttons have a mean diameter of 11.9 mm (Figure 9b: view of the back). All were recovered from near the wrists of Burial 10. Type 3 buttons also were found with this burial (see below).

Type 3

Button Type 3 is a four-holed bone button (Figure 9c). The Type 3 buttons have a mean diameter of 17.1 mm. As with the Type 2 buttons, all were recovered from Burial 10. Of the three buttons assigned to this type, one was found near the collar and two were found on top of the pelvis. The distribution of the Type 2 and 3 buttons, suggests Burial 10 was wearing a shirt with a collar and possibly a skirt or a dress when she was buried.

Type 4

Button type 4 is a small four-holed porcelain button. The two Type 4 buttons have a mean diameter of 9.4 mm (Figure 9d). All were recovered from Burial 6. The buttons were found on opposite sides of the rib cage, possibly where the wrists had been placed. If this is the case then the deceased may have been wearing a shirt with cuffs, when he was buried. Porcelain buttons have been manufactured since the eighteenth century, but it was not until Richard Prosser patented machinery in 1840 that they were machine made (Epstein and Safro 2001:74; Sprague 2002:111). The regularity of the button holes and their uniform shape suggests these are machine-made Prosser buttons.

Type 5

Button type 5 is a larger four-holed porcelain button. The four Type 5 buttons have a mean diameter of 11.0 mm (Figure 9e). Type 5 buttons were recovered from Burial 3 (n=1) and Burial 11 (n=3). In both instances, the buttons were found under the chin and near the clavicles, suggesting both individuals were wearing button up shirts or in the case of Burial 3 at least a dress or shirt with a collar. Similar to Type 4, these buttons also appear to be machine-made Prosser buttons.

Summary

A total of 16 buttons representing five different types was recovered from the Eastern State Hospital burials. Most were common nineteenth-century utilitarian bone buttons with four or five holes that were recovered from Burials 8 and 10. Generally, five-hole buttons are considered to be older, but since both four and five holed buttons were found together in Burial 10, there seems to be no significant temporal difference based solely on the number of drilled holes. The porcelain buttons found with Burials 1, 6, and 11 also date to the nineteenth century. Porcelain buttons have been manufactured since the eighteenth century, but it was not until Richard Prosser patented machinery in 1840 that they were machine made (Epstein and Safro 2001:74; Sprague 2002:111). The presence of buttons with five of the burials, coupled with the absence of pins suggests that these individuals were buried in clothes rather than shrouds.

Though small, the Eastern State Hospital button assemblage exhibited a great deal of variety, both in terms of the types of buttons found and in their context of recovery. Variation in the spatial distribution of buttons associated with Burials 3, 6, 8, and 10, suggest these individuals were not buried in standardized institutional clothing. Perhaps they were wearing clothes provided by loved ones. It also is possible that inmates made their own clothing since there was a sewing shop on site.

MISCELLANEOUS ARTIFACTS

Miscellaneous artifacts consisted mostly of ceramics (n=3), container glass (n=1), and flat glass (n=11) (Table 1). These materials accounted for 4 percent of the overall assemblage and were found in half (n=6) of the burials. While these artifacts were not intentionally placed within the coffin, their depth of recovery and proximity to the osteological remains suggests they were part of the original grave shaft fill. The undecorated whiteware body sherds were recovered from Burials 4 (n=2) and 11 (n=1). Whiteware was first produced in 1805 by Wedgwood but was not common on American sites until after 1820-1830 (Price 1979:31; des Fontaines 1990:4).

A single fragment of thin olive bottle glass was recovered next to the left humerus of Burial 8. No seams or diagnostic traits were visible on the glass fragment.

A small amount of flat window glass was recovered from Burials 4 (n=1), 5 (n=1), 7 (n=5), 8 (n=1), 9 (n=2), and 11 (n=1). The thickness of the glass ranged from 1.1 to 1.8 mm thick. The average thickness of the 11 fragments was 1.55 mm, which suggests a date of 1843 for the window glass assemblage (Moir 1987) (Table 6). The small sample size, however, limits the reliability of this date and it should be used with caution. The location of each window glass fragment relative to the skeletal remains and coffin hardware was only noted for Burial 11 where it found near the proximal end of the right femur. None of the glass fragments appears to be derived from a coffin viewing glass window.

Table 6. Window Glass Thickness.

N=	Thickness (mm)		
1	1.7		
1	1.5		
1	1.7		
1	1.6		
1	1.7		
1	1.4		
1	1.8		
1	1.7		
1	1.3		
1	1.6		
1	1.1		
		Average Thickness	**Moir Date**
11	17.1	1.554545455	1843.624

DISCUSSION

Based on the hexagonal shape of their coffins, the use of late machine-cut nails to construct the coffins and the recovery of Prosser buttons from three burials, the eleven individuals from Eastern State Hospital were likely interred after 1840 (Table 7). The small amount of materials recovered from the grave shaft fill, such as the thin window glass and whiteware sherds, also is supportive of a mid-nineteenth century date of internment (Table 7). On the other hand, the absence of button forms and other materials that post-date the 1850s, such as vulcanized buttons and mass-produced coffin hardware, points to an internment date prior to the 1860s. A date range of 1840 to the 1860s is consistent with the archival data (see previous section).

Table 7. Diagnostic Artifacts Recovered from Eastern State Hospital.

Object	N =	Date Range	Reference
Bone buttons	10	1800-1850	South 1964:122; Fink and Ditzler 1993:52
Prosser buttons	6	Post 1840	Epstein and Safro 2001:74; Sprague 2002:111
Late Cut Nails	369	1830-1880	Nelson 1968
Window Glass	11	1843*	Moir 1987
Whiteware	3	1830-P	Price 1979
* Should be considered a general date as n = 11 is not the recommended sample size for Moir's formula			

As may be expected in an institutionalized population, there was little variation in coffin hardware. The only difference noted in coffin hardware was that substantially more nails were used to construct Burial 10's coffin then were used to construct the coffins for those interred in the mass grave. The consistent pairing of 7d and 10d pennyweight nails suggests all of the coffins were manufactured at an on-site workshop. Based on the use of 10d sized medium nails this workshop also probably worked on the buildings that comprised Eastern State Hospital at that time.

The uniformity of the coffin hardware also is a reflection of the equal treatment of the patients following their death. The cost of the burials would have included the digging of a pit for the individual grave and the large trench for the mass grave, construction of the coffins, and the transfer of the coffins to the burial site. Most of this work was likely done in-house, making these burials inexpensive.

There were no personal artifacts associated with any of the recovered individuals that would indicate one individual had greater wealth at death than any of the others. Except for one belt buckle, buttons from clothing were the only personal items recovered. That they were primarily associated with women, points to differential treatment in death based on gender. But it also may indicate that men were buried in clothing that did not have button fasteners. Variation in the location of the buttons coupled with the presence of the belt buckle suggests these individuals were not wearing standardized uniforms. They may have been interred in clothes provided by loved ones or they may have made their own clothing at the institutions sewing shop.

HUMAN REMAINS AND CEMETERY DEMOGRAPHICS

An attempt was made to identify all of the recovered remains. Towards this end the *Standards for Data Collection from Human Skeletal Remains* (Buikstra and Ubelaker 1994:7) was used to ensure that the required data was collected and that it would be comparable to data collected by other researchers. These data can be used to determine an individual's age, sex, height, ancestry/heritage, and diseases they may have suffered from.

In general the remains recovered from Eastern State Hospital were in fair to good condition. Some damage was sustained from taphonomic, or post mortem changes. Two burials were disturbed by construction activity, which resulted in the commingling of the some of the remains from these two individuals. Bone fragments from Burials 1 and 2 that could not be assigned to a specific individual were classified as commingled.

Individuals were classified by age according to procedures in *Standards* (Buikstra and Ubelaker 1994). These ages were then grouped into young adult (YAD, 20 to 35 years), mature adult (MAD 36 to 50 years), old adult (OAD, over 50 years), and adult for indeterminate aged mature individuals (A). There are no individuals in this population considered to be immature or juvenile.

TAPHONOMIC CHANGES

The majority of remains from Eastern State Hospital were in a fair to good state of preservation (Table 8). Each individual was examined for signs of weathering, discoloration, burning of bones, surface texture, postmortem warping, polishing, cut marks, rodent damage, and cultural modifications. These observations were then coded by section of the body or specific bone. A total of 28 taphonomies was observed for this population. Weathering affected the most individuals with 78.5 percent exhibiting Stage 3, 4, or 5 weathering (Table 8).

Postmortem warping, while not abundant, did affect several cranial measurements. These crania exhibited warping due to damp conditions and the nature of decomposition of the body. As the bodies decomposed several of the skulls rolled slightly, which allow pressure to be exerted upon the sides of the skull. Some of the skulls also may have been damaged when the coffin wood deteriorated and the coffin collapsed. Whenever possible the each skull was reconstructed, so additional metric and nonmetric measurements could be obtained.

The most common form of discoloration observed on the Eastern State Hospital skeletal remains was metal oxidation stains. They are the result of metal objects, such as nails, leaving a rust stain on a skeletal element. All of the individuals had rust stains on some portion of bone, the location varying from individual to individual.

Table 8. Bone Weathering Stages.

Stage	Bone Weathering Stages
0	Surface shows no sign of cracking or flaking due to weathering.
1	Bone shows cracking, normally parallel to the fiber structure. Articular surfaces may show mosaic cracking.
2	Outermost concentric thin layers of bone show flaking, usually associated with cracks. Long thin flakes, with one or mire sides still attached to the bone. Deeper more extensive flaking follows, until most of the outermost surface is gone.
3	Surface is characterized by patches of rough, homogeneously weathered compact bone, resulting in fibrous texture. All the external concentric layers of bone have been removed.
4	Surface is coarsely fibrous and rough in texture; large and small splinters occur and may be loose enough to fall away from the bone if moved. Weathering penetrates into inner cavities.
5	Bone is falling apart, with large splinters. Bone is easily broken by moving. Original bone shape may be difficult to determine.

POPULATION STATISTICS

The following techniques were used to assess the sex of each burial (Buikstra and Ubelaker 1994). First, the Os Coxae were examined and scored for the following features: the ventral arc, the subpubic concavity, the ischio-pubic ramus ridge, the greater sciatic notch, and the preauricular sulcus. Next, features of the cranium were scored for size of the nuchal crest, mastoid process, supra orbital margin, prominence of the glabella, and mental eminence. Each individual was then assigned to one of the following categories:

0= **undetermined sex.** Sex could not be determined.
1= **female**. Little doubt the identified attributes represent a female.
2= **probable female**. Attributes more indicative of female than male.
3= **ambiguous sex**. Sexually diagnostics features are ambiguous.
4= **probable male**. Attributes more indicative of male than female.
5= **male**. Little doubt identified attributes represent a male.

Age was determined by utilizing the Todd and Suchy-Brooks methods for recording age related changes in the pubic symphyseal faces and auricular surfaces of the pelvis, and cranial suture closure as described in *Standards for Data Collection from Human Skeletal Remains* (Buikstra and Ubelaker 1994:21-25). Morphological changes of the pubic symphyseal face are considered to be among the most reliable criteria for estimating age at death. The auricular surface exhibits systematic age related changes, and is more frequently preserved that the pubis, therefore providing a useful way to observe age related changes. Cranial sutures generally close or fuse with increasing age, but individual variability has been note in the rate of suture closure. However, when considered with other criteria cranial suture closure can be a useful method for determining age at death. Buikstra and Ubelaker (1994:32-37) provide a composite technique for scoring cranial suture closure.

The Eastern State Hospital skeletal population was comprised of almost equal numbers of men and women (Figure 10). There were four individuals who were male,

and one who was probably male (PM) based on body size (all other skeletal markers for sex were damaged) (Table 9; Figure 11). For analytical purposes this individual was classified as a male. The remaining six individuals were classified as female. All eleven individuals are over 35 years old (Table 9). One female (35-45) and one male (35-50) were classified as mature adults (MAD; 35-50 years of old). Of the remaining burials, eight were classified as old adults (OAD; greater than 50 years old) with the majority of these individuals (n=5) being over the age of 60 years or as an adult of undetermined age (n=1).

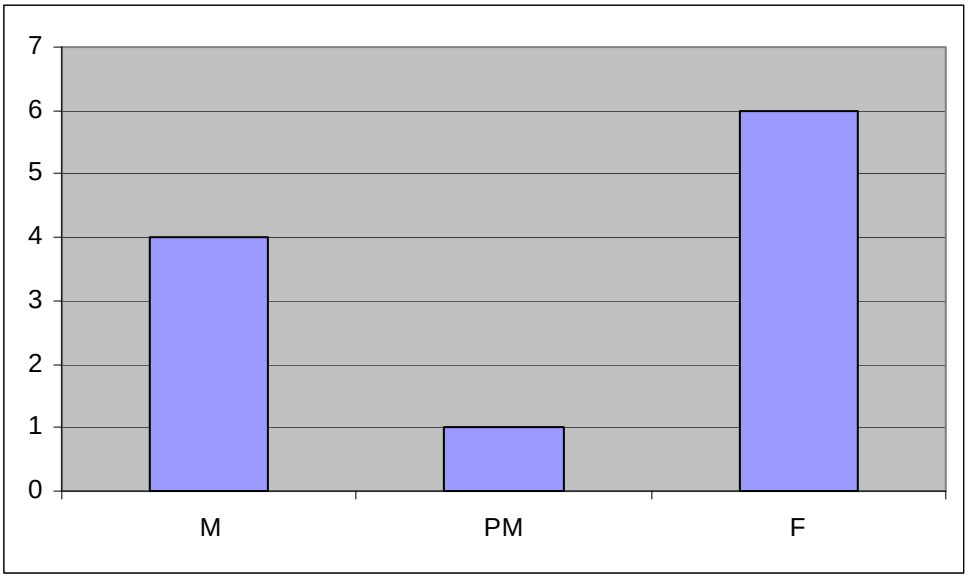

Figure 10. Sex Distribution.

Table 9. Age Distribution.

Burial Number	Age in Years	Age Group
1	60+	OAD
2	60+	OAD
3	60+	OAD
4	60+	OAD
5	50-59	OAD
6	A	ADULT
7	35-45	MAD
8	60+	OAD
9	35-50	MAD
10	50-59	OAD
11	40-50	MAD

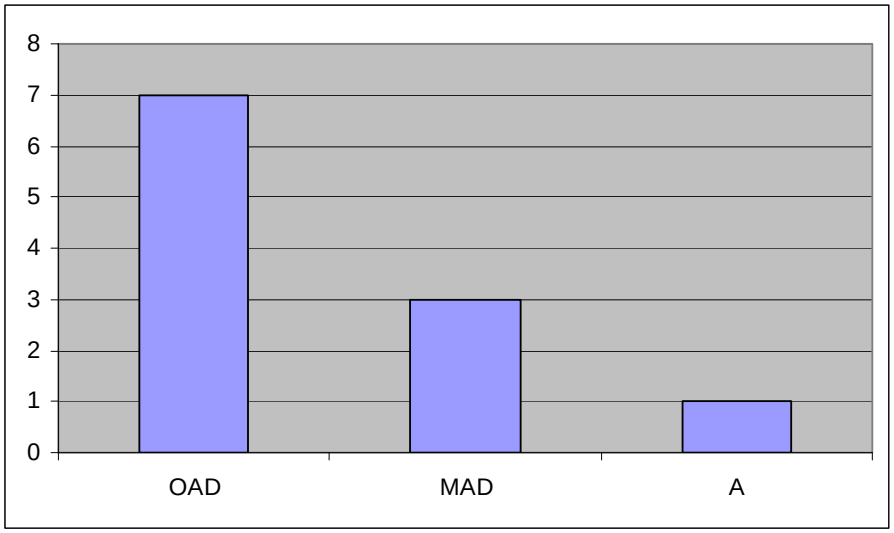

Figure 11. Age Group Frequency.

STATURE

Stature was calculated using regression formulae developed by Bass (1995) (An attempt to use Fordisc 2.0 to confirm these estimates was not successful due to the poor and fragmented condition of the longbones [Owsley and Jantz 1996]). Bass's formulae calculates stature based on the size of the humerus, radius, ulna, femur, tibia, and fibula. The results of each regression formula are then averaged to obtain an estimate of an individual's height (Table 10). The average height for this population is approximately five feet, five inches tall. One individual (Burial 8) is very short at four feet, eleven inches, while Burial 6 is tall for this time period at six feet one inch tall.

The average stature for the 1840s is five feet seven inches tall. Five of the individuals from Eastern State Hospital are shorter than this average, while five are taller, and one is corresponds to the average height for this time period. Burial 8's exceptionally short stature could indicate that this individual experienced a great deal of nutritional stress during childhood. Alternatively, her shorter than expected height as well as Burial 6's taller than expected height may simply reflect the range in variation in height that one might expect to see in a mid-nineteenth century Kentucky community.

On average, the population from Eastern State Hospital is five inches taller than the middle and old adult population from the Old Frankfort Cemetery, who have an average stature of approximately five feet (Killoran 2007). The average height of the individuals from Eastern State Hospital is approximately five feet, six inches.

Table 10. Average Heights in Centimeters and Feet.

Burial	Cm	+/-	Feet	+/-
1	168.09	4.38	5’6”	1.52
2	172.01	4.47	5’8”	1.76
3	164.58	3.99	5’5”	1.57
4	159.56	4.12	5’8”	1.62
5	174.38	4.38	5’9”	1.67
6	184.74	4.28	6’1”	1.68
7	157.33	3.99	5’2”	1.4
8	151.48	3.94	4’11”	1.55
9	169.19	4.41	5’6”	1.73
10	177.06	3.85	5’8”	1.75
11	170.97	3.85	5’7”	1.51

PATHOLOGY AND TRAUMA

Each individual from the Eastern State Hospital population was examined for pathologies (Buikstra and Ubelaker 1994). Abnormal bone shape, size, loss or formation, fractures and dislocations, porotic hyperostosis, vertebral pathologies, and arthritis may be indicative of the presence of a particular pathology. Identification of these pathologies can contribute to an understanding of the general health of an individual and a burial population. This section will discuss the prevalence of pathological conditions within the Eastern State Hospital population.

Abnormalities of shape can occur on longbones and cranial bones. Abnormally shaped longbones can be bowed, which frequently results from disease (i.e., Ricketts), or angulated, which are the result of healed fractures. Abnormal cranial bone shape can occur due to early closure of cranial sutures. The spinal column also can exhibit abnormal shape in the form of *kyphosis* (anterior/posterior curvature) or *scoliosis* (lateral curvature). Abnormal size occurs in the form of enlargement or reduction in the average size variations, such as hydrocephaly (enlarged cranial vault) or achondroplastic dwarfism. Abnormal bone loss may be either focal (a single site) or diffuse (multiple sites) and are common expressions of osteoporotic changes. Abnormal bone formation may be observable as lamellae or vertical spicules of bone added to intact surfaces. Bone formation can be the result of degenerative bone diseases, such as Paget’s disease, or from traumatic origin, such a healed fractures or dislocations. Woven bone also may appear as abnormal bone formation.

Partial or complete fractures and dislocations were classified as “green-stick.” They usually are the result of bending stress placed on juvenile longbones or adult ribs. Fractures were further classified as simple, spiral, compression, depression or projectile, or gunshot wounds. Dislocations may be the result of trauma or congenital processes. Porotic hyperostosis is a specific type of abnormal bone loss that occurs in the cranial vault and/or eye orbit roof and is thought to represent an anemic response. Vertebral pathologies vary widely and can include Schmorl’s nodes or depressions in the superior and inferior surfaces of vertebral bodies and the formation of spicules either horizontally

or vertically from the vertebral body. Arthritic responses include lipping, porosity, and eburnation as well as polishing of the affected bone (Buikstra and Ubelaker 1994:113).

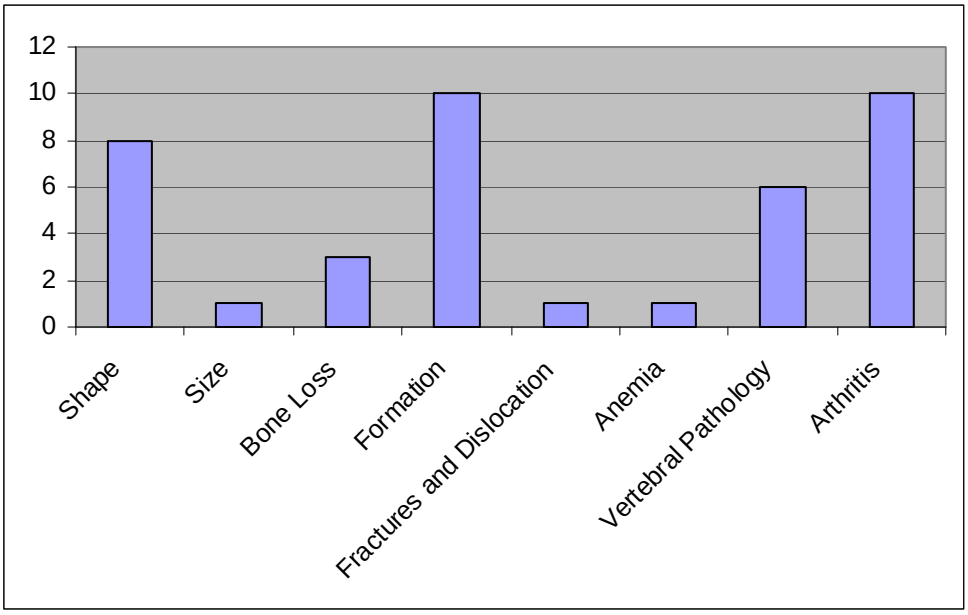

Figure 12. Number of Individuals with Each Pathology.

The most prevalent pathologies in this population were abnormal bone formation and arthritis (Figure 12). With the exception of Burial 11, who was too poorly preserved to collect this type of data, abnormal bone formation and arthritis were associated with all of the individuals recovered from Eastern State Hospital. Most of the abnormal bone formation was observed on the anterior crest of the tibiae, and was represented by woven bone deposition and large callous formation just below the knee (Burials 2, 3, 4, 5, 6, 7, 8, 9, and 10). Woven bone deposition, can be associated with arthritis, infection, or it can provide extra support for a bone, to stabilize in the event of strenuous labor. In the Eastern State Hospital population it may have been a combination of arthritis, and a result of these individuals having performed some form of labor while on their knees, which resulted in callous formation just below both knees. Arthritis was also observed on the shoulder of burial 10 and the vertebral column of several individuals (see below).

In addition to callous formation, large muscle and tendon attachments were observed on the anterior crests of the tibiae of all of the burials, except for Burials 1, 6, and 11 due to the poor condition of their remains. The location of these large muscle and tendon attachments further supports the hypothesis that these individuals performed heavy labor while kneeling. Burials 2, 3, and 5 also had heavy muscle and tendon attachments on their humeri and femora, indicating they performed heavy labor that involved both their arms and legs.

Not only did Burial 5's tibias exhibit woven bone deposits, but a large amount of woven bone deposits were observed in association with several other bones (clavicles, patellae, calcanea, and fibulae). This individual also exhibited ossification of costal

cartilage, or the cartilage that attaches ribs to the sternum. Both conditions are probably a result of infection, though as previously noted for the tibia the woven bone associated with these skeletal elements also could be indicative of having performed heavy labor.

Another good example of woven bone was the thickening of the cortex, or outer table, of Burial's 7 femora. Again while may have resulted from infection, it also could reflect the buttressing of the bone, for stabilization during the performance of heavy labor.

Bone spicules, which form in cartilage as a result of infection or injury, are another type of abnormal bone formation. This condition was observed on skeletal elements from Burials 5 and 10. Spicule formation associated with Burial 5 is present on the cervical vertebrae (see below) and both ilea, superior to the auricular surfaces. The latter consists of an area where the pelvis is attached to the sacrum by cartilage. When considered with the previously mentioned extensive woven bone deposition and ossification of costal cartilage, the bone spicule could be further evidence that this individual suffered from several infections that were of sufficient severity to affect their skeletal remains.

The spicule observed on Burial 10 is associated with an injury to the shoulder girdle. This individual suffered a dislocated right shoulder, which produced spicules around the glenoid fossa (the socket to receive the humerus head), right clavicle, and the right humeral head. Lipping of the rim of the glenoid fossa, which is a caused by arthritis, also was noted. All of these abnormal bone formations indicate this individual suffered arthritis in this shoulder, after the shoulder joint had been reunited and begun to heal.

The next most common pathology was abnormal bone shape (Burials 1-7, and 10). This was primarily manifested in this burial population by the twisted appearance of one or more long bone diaphysis (Burials 1-7). Burials 1 and 2 exhibited bowing of the left and right humeri, radii, and ulnae; Burials 3, 4, 6 and 7 exhibited narrowing of the humeri, radii, and ulnae diaphyses, and twisted or bowed shafts; Burial 10 exhibited narrowing of the tibae. In addition to their arm bones, Burials 5 and 7 exhibited narrowing of their femurs and fibulae diaphyses, and twisted or bowed shafts. The presence of these abnormally shaped longbones points to nutritional deficiencies that caused weaknesses in these skeletal elements (see next chapter for other examples of nutritional stress among this burial population). Burial 1 clearly appears to have suffered from Rickets, a childhood disorder that is a result of a lack of vitamin D, calcium, or phosphate. This vitamin deficiency results in the progressive weakening of the longbones, which eventually causes destruction of the supportive matrix and the bowing of the arm and leg bones. While Burials 2-7 and 10 also may have suffered from Rickets, the longbone pathologies associated with these individuals could not be associated with this disorder with the same degree of confidence. Thus, it is possible that their abnormally shaped longbones were caused by other as yet unidentified vitamin deficiencies.

One of individual (Burial 10) exhibited abnormally shaped and sized cranial bones. The skull of this burial was very narrow and her facial structure could be

described as beaky. Additionally, the overall size of the skull was small in relation to this woman's body size. This abnormality may be the result of a congenital disorder; possible pituitary dwarfism or "congenital idiot" (feeble minded).

Three individuals had abnormal bone loss in the form of pinhole perforations or focal bone loss areas: one (Burial 3) on the pelvis, near the acetabuluae; one (Burial 7) on the medial malleolus of the tibiae; and one (Burial 4) on the interior portion of the talus between the articular facets. This type of pinhole perforations is associated with osteoarthritis, and as seen here often occur in the area of joints.

Six individuals exhibited vertebral pathologies ranging from mild to moderate Schmorl's nodes and from mild to severe horizontal and vertical lipping on the superior and inferior surfaces. All of the identified vertebral pathologies are indicative of arthritis. Burial 2 has evidence of arthritis in elevated rings on the superior and inferior surfaces of the thoracic vertebrae. Although the vertebrae from Burial 3 were badly damaged, they did have elevated rings and Schmorl's nodes on the centra. Burial 4 exhibited elevated rings on the superior and inferior surfaces of all the vertebrae and the superior articular surface of the sacrum. Burial 5 had curved spicules on the cervical vertebrae and elevated rings on the centra of all the thoracic and lumbar vertebrae. Burial 7 had elevated rings on the centra of all the vertebrae and Schmorl's nodes in the centra of the thoracic vertebrae. Burial 8 had large elevated rings on the centra of all the vertebrae.

Only one individual (Burial 9) had a healed fracture. This individual had fractured their left fibula, but it had completely healed well before their death. In addition, to Burial 9, as previously mentioned Burial 10 had a healed dislocated shoulder.

No individuals within this population exhibited evidence of porotic hyperostosis (evidence of anemia in the eye orbits), but Burial 3 did have arachnoid fossa (evidence of anemia in the cranial vault) in the interior table of the parietal bones, suggesting this individual suffered from iron deficient anemia.

DISCUSSION

Skeletal evidence suggests a population of older men and women, who during their lifetimes undertook a great deal of hard work. Analysis of the skeletal remains indicates both males and females were engaged in strenuous labor as reflected by enlarged muscle attachments and remodeling of their tibias, which is indicative of kneeling for prolonged periods of time. While it is possible that some of this work was undertaken during the time they were residents of Eastern State Hospital, it is quite likely that much of it was undertaken prior to their admittance to the hospital. Unfortunately, since we do not know the identities of these individuals, there is no way to know how old they were when they were admitted or how long they stayed at the hospital.

The average stature of these individuals falls at or close to the average for the 1840s, indicating these individuals were likely cared for and had adequate nutrition during childhood, though as will be discussed in the next section during their early years most experienced periods of nutritional stress. Burial 8 appears to be an exception to this pattern, as evidence by her especially short stature. She did, however, live into her

sixties, which indicates that she was able to survive despite of poor childhood nutrition. It is also worth noting that the Eastern State Hospital burial population is taller than the population recovered from the Old Frankfort Cemetery. This could indicate that the former had better nutrition during infancy and childhood (Killoran 2007).

While it is obvious from arthritic joints, woven bone deposition, abnormal bone shape that these individuals suffered from a variety of aliments and diseases, such a rickets, analysis of the skeletal remains did not provide conclusive identify specific pathogens that may have caused death of any of these individuals. It should be noted that may diseases, such as Cholera and dysentery, leave no distinguishing markers on the skeleton. Individuals with tuberculosis, for example would be expected to have lesions on the ribs with ossified connective tissue. Nothing of this sort was observed in the Eastern State Hospital population.

While it presumed that everyone who was recovered from the Eastern State Hospital property had been a resident of this hospital, only one individual exhibit skeletal evidence indicative of a mental disorder. This individual (Burial 10) had a congenital disorder known as pituitary dwarfism, or "congenital idiot," that may have led to some state of mental retardation. Other individuals may have suffered from some mental defects that left no skeletal evidence.

DENTAL ANALYSIS

DENTAL INVENTORY

The Eastern State Hospital dental collection consisted of a mixture of intact mandibles and maxillae with dentition, partially intact mandibles and/or maxillae with dentition (including loose teeth and teeth still in alveolar sockets), intact and/or partially intact mandibles and maxillae with all teeth lost either pre-mortem or post-mortem, and loose teeth with no associated alveolar bone (Table 11). A code was developed to express completeness of the mandible and maxilla: "1" represents a fully complete mandible or maxilla; "2" represents a completeness of 25 to 75 percent; "3" represents less than 25 percent complete; and "9" represents missing bone.

Table 11. Completeness of Mandibles and Maxillae.

Burial	Mandible	Maxilla
1	9	9
2	2	2
3	1	1
4	1	1
5	1	1
6	2	3
7	1	1
8	1	2
9	3	3
10	1	1
11	3	3

All of the individuals in the Eastern State population were inspected for dental attributes by use of Buikstra and Ubelaker's (1994) *Standards for Data Collection from Human Skeletal Remains*

DENTAL WEAR

Since dental wear reduces the locations available for caries to develop and enamel hypoplasias to be recorded, and thus the prevalence of both within a burial population, the amount of attrition must be considered in a thorough dental analysis. Wear was recorded for 189 teeth (80 maxillary and 109 mandibular) from both the left and right side of the arcade utilizing methods developed by Smith (1984) and Scott (1979). The Smith (1984) system of scoring dental attrition applies to the incisors, canines, and premolars. Wear is recorded on an eight-point scale, based on the amount of exposed dentin, with a score of "1" representing unworn or polished incisal surfaces and "8" representing a complete loss of the crown with no enamel remaining. The Scott (1979) system of scoring dental attrition applies to the molars. The molars are divided into quadrants and attrition is scored on a scale of "1" to "10." The final score is the sum of all the quadrants observed. A quadrant score of "1" represents wear facets that are invisible or very small, while a score of "10" represents a quadrant in which no enamel remains.

Wear was visually inspected and recorded on all permanent teeth. Wear scores were then divided into three levels: low (L), moderate (M), and heavy (H). For the incisors, canines, and premolars, those with wear scores of "1" or "2" were considered to have low wear; those with scores of "3," "4," or "5" were considered to have moderate wear; and those with scores of "6," "7," or "8" were considered to have heavy wear. For the molars, those teeth with overall wear scores (all four quadrants summed) between "1" and "12" were considered to have low wear; those with a wear score between "13" and "24" were considered to have moderate wear, and those with wear scores between "25" and "40" were considered to have heavy wear. All teeth were then grouped into the low, moderate, and high wear pattern categories based on their scores. Due to the fact that dental wear can vary tremendously within individuals, wear score data is presented in Tables 12 and 13 by burial. Based on an initial examination of this table, it was initially thought that the women recovered from Eastern State Hospital had more dental wear than the men. However, the observed differences are deceptive as the men are missing more teeth due to premortem decay and loss, congenital absence, and postmortem loss. When tooth loss is accounted for, both sexes appear to have similar tooth wear patterns.

The majority of dental wear fell into the low or moderate category, with 29 percent (n=24) of maxillary teeth exhibiting low wear and 63 percent (n=51) moderate wear. Only 9 percent (n=7) of the maxillary teeth had heavy wear. Twenty-two percent (n=28) of the mandibular teeth had low wear and 57 percent (n=68) had moderate wear. In contrast to the maxillary teeth, 19 percent (n=23) of the mandibular teeth exhibited heavy wear. The upper left first (n=3) and second (n=3) molars, lower left third molar (n=3), lower right canine (n=3) and lower right third molar (n=3) had the most incidences of low wear. Moderate wear was observed most often on the upper right first (n=5) and second (n=5) premolars, lower left first (n=5) and second (n=5) incisors, and the lower left canine (n=5). Heavy wear was most often observed on the upper right first premolar (n=2), and lower left first (n=3) and second (n=3) premolars. Of the 11 burials examined, most of the mandibular wear was associated with three individuals (Burials 3, 4, and 5). These are some of the oldest individuals in the burial population suggesting this increased wear is associated with their age.

Most of the teeth associated with the burials recovered from the Eastern State Hospital site exhibited moderate tooth wear, but three females (Burials 3, 4, and 10) and three males (Burials 1, 5, and 6) had teeth that exhibited heavy wear. Among the females Burial 3 had one maxillary tooth and four mandibular teeth with high wear; Burial 4 had six mandibular teeth and one maxillary tooth with high wear, and Burial 10 had three mandibular teeth with high wear. Of the three males, Burial 5 exhibited the most wear with two maxillary and eight mandibular teeth exhibiting high wear. With respect to the remaining two burials, Burial 1 had two maxillary and two mandibular teeth that were heavily worn and Burial 6 had only one tooth that exhibited heavy wear.

Five of the 11 burials did not exhibit heavy wear. Of these, Burial 2, a male, and Burial 9, a male exhibited only moderate wear scores, Burial 7, a female, exhibited only low wear scores, and Burial 8, a female, and Burial 11, a female, exhibited a combination of moderate and low wear scores. These lower wear scores could indicate that these individuals consumed diet that contained less grit than the other individuals or as previously mentioned older individuals may have higher incidences of heavy wear.

Table 12. Maxillary Tooth Wear.

	Right Upper Teeth								Left Upper Teeth							
Burial	**M3**	**M2**	**M1**	**P2**	**P1**	**C**	**I2**	**I1**	**I1**	**I2**	**C**	**P1**	**P2**	**M1**	**M2**	**M3**
1	-	-	-	-	-	H	-	-	-	-	H	-	-	L	-	L
2	M	M	M	-	M	-	M	M	M	-	-	-	-	M	M	M
3	M	M	M	M	M	M	M	M	M	M	M	H	M	M	L	L
4	-	-	-	-	-	-	-	-	M	M	-	-	-	H	-	-
5	M	M	M	M	M	-	-	-	-	-	-	H	H	-	M	M
6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	H
7	-	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L
8	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
9	-	-	-	M	-	-	-	-	-	-	-	-	-	-	-	-
10	L	L	M	M	M	M	M	M	M	M	M	M	M	L	L	-
11	L	-	-	M	M	M	M	-	M	-	M	M	-	-	-	-

Table 13. Mandibular Tooth Wear.

	Right Lower Teeth								Left Lower Teeth							
Burial	**M3**	**M2**	**M1**	**P2**	**P1**	**C**	**I2**	**I1**	**I1**	**I2**	**C**	**P1**	**P2**	**M1**	**M2**	**M3**
1	-	-	-	-	-	-	H	H	-	-	-	-	-	-	-	-
2	M	M	M	M	M	M	-	-	-	-	-	-	-	-	-	-
3	L	M	M	M	M	M	M	M	M	M	M	H	H	H	H	L
4	-	-	-	-	-	-	-	-	H	H	H	H	H	H	-	-
5	L	-	-	H	H	-	H	H	H	H	M	H	H	-	-	L
6	M	M	M	M	-	-	-	-	-	-	-	M	M	M	M	-
7	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	-
8	M	M	M	L	L	L	M	M	M	M	L	M	M	M	M	M
9	-	-	-	-	-	-	M	M	-	-	-	-	-	-	-	-
10	M	-	-	H	H	H	M	M	M	M	M	M	M	M	M	M
11	L	-	L	M	M	L	M	M	M	M	L	M	-	M	M	L

Overall, the wear pattern for the Eastern State Hospital population is typical of a historic population that consumed foods with a moderate amount of grit (Hillson 1979). The individuals from Eastern State Hospital experienced fair dental health, with approximately 60 percent of all the teeth exhibiting moderate wear. Historic populations typically consumed processed foods that were that contained a moderate amount of grit resulting in some dental attrition (wear). As a result, dental attrition was typically slow.

That the mandibular teeth exhibited more heavy wear than the maxillary teeth, however, is an unusual pattern of dental attrition not usually associated with normal dental wear. Normal dental wear would produce a pattern where the cheek teeth retain surface features while anterior teeth would have lost their occlusal surface features (Hillson 1996:233). In this population however, both the cheek teeth and anterior teeth have heavy wear on the occlusal surfaces. This pattern may be indicate that some individuals did consume food that contained more grit than others, or it could be due to bruxism or the grinding or tapping of the teeth, either when asleep or unconsciously while awake, or some other as yet unidentified cultural practice.

DENTAL CARIES

Dental caries are a disease process characterized by the focal demineralization of dental hard tissues by organic acids produced by bacterial fermentation of dietary carbohydrates, especially sugars (Larsen 1982, 1987; Newbrun 1982). Numerous factors contribute to the number of caries observed on individual teeth and their distribution within the mouth. Among them are the presence of oral bacteria, salivary glycoproteins, plaque, diet, tooth crown morphology and size, developmental enamel defects, such as hypoplasias, attrition, food texture, systemic diseases, age, heredity, salivary composition and flow, nutrition, periodontal disease, and enamel composition. The ultimate result of caries is cavitation, and if left unchecked, pulpal disease. In very extreme cases, the infection from a carious lesion may extend into the sinuses and cause death (Haymaker 1945). Dental caries is an age-progressive process, meaning that older individuals would typically have higher caries rates.

Dental caries appear as dark eroded regions of the tooth enamel. Tooth surfaces vary in susceptibility to caries, with the more complex occlusal surfaces of the molars being more affected than the smooth occlusal surfaces of the incisors. Method developed by Moore and Corbett (1971) were used to collect data on caries observed on the teeth of the Eastern State Hospital burial population. The location of each carious lesion was recorded on each tooth by examining the tooth surface and assigning a number code from "1" to "7." The size of the lesion was not recorded due to the fact that caries are age-progressive.

An inverse correlation between low wear and high caries rates has been documented in numerous populations (Armelagos and Rose 1972; Carbonell 1966; Dahlberg 1960; Powell 1985; Van Reenen 1966). It has been postulated that heavy wear decreases the available surfaces where caries can develop. As such, populations that consume coarser, grit-laden diets tend to have lower caries rates due to the coarser foods

facilitating natural cleaning of the tooth crowns. Conversely, populations that have diets high in cariogenic foods and low wear rates have high caries rates, since wear would not remove the crevices where caries tend to develop.

The caries rates for the Eastern State Hospital population were analyzed as age-specific frequencies and further divided by sex. Data is presented as individuals with at least one carious tooth and the percent of the population they represent. Seventy-three percent of males and females had one or more carious lesion. All of the males (n=1) and females (n=2) in the Middle Adult (35-50 years) group had one or more carious lesion (Burials 7, 9, and 11). Of the eight Old Adults, three (Burials 1, 5 and 8; 2 males and 1 female) did not have any caries. All of the other Old Adults (Burials 2-4, 6, and 10; one male and four females) had one or more carious lesions (Table 14). A diet high in cariogenic foods coupled with low to moderate dental wear would have contributed to the caries rate observed in the Eastern State Hospital population. Only three of the five males have caries, due to in part to heavy dental wear, which reduces the locations available for caries to develop.

Table 14. Caries Rates for Eastern State Hospital Burials.

	MAD (35-50) Males	MAD (35-50) Females	OAD (50+) Males	OAD (50+) Females	Total
Total	1	2	4	4	11
One or more lesion	1	2	1	4	8
Percent one or more lesion	100	100	25	100	73
Burials 1, 5, and 8 had no caries					

DENTAL ABSCESSES

Most dental abscesses are the result of inflammation of the pulp cavity that has led to a periapical granuloma. Irritants, which enter the pulp cavity through dental caries, attrition, or a tooth fracture, can cause inflammation. This increases pressure inside the tooth and eventually causes pulp death. At this point there is an accumulation of pus within the pulp chamber, which travels down the root canal and eventually emerges from the apical foramen. The emergence of the pus and toxins from the open root canal forms a periapical granuloma. The surrounding periodontal tissues are resorbed to accommodate the growing granuloma. The increasing pressure of the granuloma is typically released through the buccal periodontal bone, which is observable in bone as an abscess (Hillson 1996). Abscesses also may appear on the lingual side, in the nasal cavity, or in the maxillary sinus but these occurrences are rare.

Abscesses were recorded as follows (Buikstra and Ubelaker 1994): each abscess was assigned a number code with “1” being a buccal abscess and “2” representing a lingual abscess. Only two individuals had abscesses: Burial 5, a 50-59 year old (OAD) male; and Burial 10, a 50-59 year old (OAD) female. There were two abscesses observed on Burial 5’s dentition. One was on the upper left first molar and was coded as “1,” while the other was on the lower left canine and also was coded as “1.” Two abscess

also were observed on Burial 10's dentition (Figure 13). One abscess was on the upper right second molar and was coded as "1" or a buccal or labial alveolar channel. The other was a large abscess involving the upper right first molar and second premolar and was coded as "1." Resorption of the alveolar bone also was observed.

Figure 13. Abscess of the Right Maxillary Molars and Premolar (Burial 10).

DENTAL MORPHOLOGY

Dental morphologic traits were scored with the aid of the Arizona State University (ASU) dental casts developed by Christy Turner II of the Department of Anthropology. Two morphologic traits were examined in order to aid in the determination of biological affinity: shovel-shaped incisors and Carabelli's trait.

Shoveling

Shoveling describes a hereditary morphologic trait in which the marginal ridges in the permanent incisors (typically the maxillary incisors) are prominent and create a fossa on the lingual surface of the tooth. This trait has been observed in Asians and Native American groups at higher frequencies (60 to 90 percent) than in Europeans and Africans (0 to 15 percent) (Scott and Turner II 2000). Shoveling data can be grouped as follows: Scores "0," "1," and "2" represent those individuals who are not considered to exhibit the trait, while scores of "3," "4," and "5" are considered to have distinct shoveling. Scott and Turner II (2000) consider these groupings the "breakpoint" of this particular trait.

Of the six individuals with maxillary central incisors present and which did not have sufficient wear to remove this trait completely; five had a score of "0" or no shoveling present. Burial 7 had a score of "3" (semi-shovel) on the left first and second incisors and the right first incisor, and a score of "2" (trace shoveled) on the right second incisor (Figure 14). The presence of these shovel shaped incisors suggests that Burial 7 may have had Native American heritage, or at least a mixture European and Native American heritage (see below).

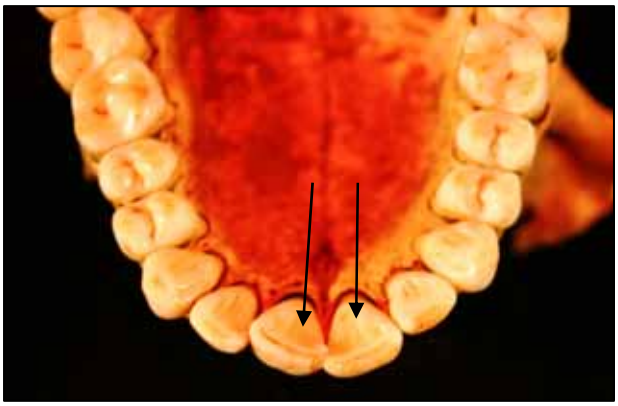

Figure 14. Shovel Shaped Maxillary Central Incisors (Burial 7).

Carabelli's Trait

The Cusp of Carabelli is a morphologic trait arising from the base of the mesiolingual cusp of the upper molars. When present, it is most commonly found on the upper first molar. It is sometimes observed on the upper second molars, but rarely seen on the upper third molars. It can range in size from a large cusp, rivaling the main cusps of the tooth in size, to a small ridge, pit or furrow. The scoring system developed by Dahlberg (1956) classifies this feature on a numerical scale from "0" (complete absence, mesiolingual cusp is smooth) to "7" (a large free cusp). Scores between "0" and "4" are not considered to indicate the presence of the trait while scores "5" through "7" are considered the "breakpoint" according to Scott and Turner II (2000). Carabelli's trait is most frequent in individuals of European descent (20-30 percent) and least common in American Indians and populations from North Asia (0-10 percent). Africans show a mean percent frequency of 15-20 percent, placing them in the "high intermediate group" (Scott and Turner II 2000).

Seven of the individuals in the Eastern State Hospital population (Burials 2-5, 7, 10, and 11) had one or more maxillary molar that had scores of 5 or more, indicating the presence of Carabelli's trait. The presence of this morphological trait suggests these seven individuals had European heritage. As noted previously, that Burial 7 also had shovel shaped incisors suggests this individual may have had a mixture of European and Native American heritage.

ENAMEL DEFECTS

Human dentition can reflect the nutritional status of an individual during the years of tooth development. Markers in dentition, such as enamel hypoplasias, have consistently been associated with malnutrition and disease (Chavez and Martinez 1982; Goodman and Rose 1990, 1991; Goodman et al. 1989; Solomons and Keusch 1981). By examining enamel hypoplasias (EH), an overall nutritional state of an individual can be inferred. Enamel hypoplasias are the result of a temporary disturbance in amelogenesis, or enamel development that leads to deficiencies in the enamel thickness that leaves visible markers in the relatively permanent enamel that is deposited during the time of stress (Suckling 1989, after Weinmann et al. 1945). These defects in the thickness of the enamel can be manifest as single or multiple pits, narrow or wide troughs, or areas of entirely missing enamel. They are quantitative defects as opposed to enamel opacities, which are qualitative defects. Opacities involve change in color and opacity of enamel, indicating differences in hardness or quality of enamel (FDI 1982). Because enamel does not remodel once it is formed, enamel hypoplasias are permanent markers left on the tooth crown that are not lost as a result of heavy wear or pathological conditions, such as caries.

Enamel hypoplasias cannot be attributed to a specific pathological condition or nutritional deficiency. They can, however, be used as an indicator of developmental disturbances caused by some sort of metabolic stress. The locations of these defects can then be measured to obtain a relatively accurate estimate of the age of the individual during the time of stress. Due to the regular and ring-like deposition of human enamel, and the permanent, non-regenerative nature of enamel, measurements of enamel hypoplasias can be placed in regression equations to calculate the age of the individual at the time of the disturbance.

Through a series of studies, Goodman et al. (1980, 1984) suggest that enamel hypoplasia analysis focus on incisors and canines. In a 1980 study on a prehistoric population from Illinois, they report that the maxillary central incisors combined with the mandibular canines were the most hypoplastic, with over 95 percent of the total growth disruptions observed in their study being observed on at least one of these teeth (Goodman et al. 1980:526). They determined that in general, stress episodes that produced defects on the labial surface of a tooth were concurrently manifest on the lingual teeth. Subsequent studies have focused on maxillary and mandibular incisors and canines (Goodman and Rose 1991; Goodman et al. 1987; Hodges 1987; Hutchinson and Larsen 1988; Lanphear 1990; Van Gerven et al. 1990). The study of the Eastern State Hospital population followed this example and focused on the enamel defects represented on the maxillary and mandibular incisors and canines. For each tooth type, only the left side of the arcade is reported. When the left tooth was not observable, the right antimere was substituted. This eliminates duplicitous reporting of single stress episodes.

All of the teeth associated with the 11 individuals recovered from Eastern State Hospital were observed for the presence of enamel hypoplasias. These included both

complete and partial dentitions. Of the 11 individuals in this burial population, only seven had teeth suitable for recording this trait. The four individuals (Burials 6, 8, 9 and 11) whose dentition was not suitable had either lost teeth premortem, the enamel was damaged postmortem, or the teeth were not recovered during excavation of these burials. Of the seven individuals with teeth observable for hypoplasia analysis, only one individual (Burial 7) had maxillary and mandibular incisors and canines with wear scores of "2" or lower (according to Scott 1979 scoring system). Thus calculation of the age of insult could only be calculated for this individual.

Hypoplasias were scored on the labial surface of each tooth with the aid of a magnification light. Measurements were taken to the nearest 0.02 mm from the mid-point of the defect to the cemento-enamel-junction (CEJ) by use of sliding calipers. Defects were scored as linear horizontal grooves, linear vertical grooves, linear horizontal pits, nonlinear arrays of pits, and single pits. These are all treated as a single class of defect in the statistical analyses. The labial crown height was recorded for each tooth from the left side of the arcade. When the left tooth was not observable, the right antimere was substituted. Rather than using Goodman's (1988) crown heights standards, which was derived from a Swedish population, a population specific series of regression equations was developed to calculate age of onset of hypoplasias for the Eastern State Hospital population, based on the analysis completed for the Old Frankfort Cemetery (King 2007).

Seven individuals from Eastern State Hospital were observed to have hypoplasias with female maxillary central incisors averaging the highest number of defects, followed by maxillary canines (Table 15). That more defects were identified in female than male teeth reflects the greater number of female teeth included in this analysis. Because Burial 7 is the only individual with dentition suitable for calculation of the age of onset of hypoplasias, the mean maximum crown height was not calculated for this population (Table 16). (Teeth with wear scores of "3" or greater [Scott 1979 scoring system] were omitted from this calculation.)

Table 15. Defects Observed per Tooth Type.

	Central Incisor (I1)		Lateral Incisor (I2)		Canine	
	# defects recorded (# of teeth observed)	Average # defects per tooth	# defects recorded (# of teeth observed)	Average # defects per tooth	# defects recorded (# of teeth observed)	Average # defects per tooth
Maxilla						
Males	1 (1)	1	0	0	0	0
Females	6 (4)	1.5	2 (2)	1	4 (3)	1.33
Mandible						
Males	1 (1)	1	1 (1)	1	1 (1)	1
Females	1 (1)	1	1 (1)	1	1 (1)	1

Table 16. Crown Heights for Burial 7.

Tooth	Crown Height
Maxillary	
C	9.39
I2	8.16
I1	8.25
Mandibular	
C	8.45
I2	7.60
I1	6.84

The age of enamel formation was taken from the developmental sequences of Massler et al. (1941) and Shaw and Sweeney (1973). Calculation for the age of onset of enamel defects was based on the method presented by Goodman and Rose (1990), which was modified from Swardstedt (1966), using the developmental sequence of Massler et al. (1941). Age of onset of hypoplasias was calculated using regression equations for adult females that incorporate the crown height for Burial 7 and the ages of enamel formation (Table 17). These equations assume a constant velocity of enamel formation (Goodman and Rose 1990, 1991).

Table 17. Regression Equations for Estimations of Age at Formation of Linear Enamel Hypoplasias in Years for Burial 7.

Tooth	Regression Formula
Maxillary	
C	Age = - (.696 x HT) + 6.0
I2	Age = - (.391 x HT) + 4.5
I1	Age = - (.456 x HT) + 4.5
Mandibular	
C	Age = - (.666 x HT) + 6.5
I2	Age = - (.551 x HT) + 4.0
I1	Age = - (.642 x HT) + 4.0

The average age of onset for Burial 7's hypoplasias is 2.56 years (Table 18). This places the age of onset for this individual within the peak occurrence of hypoplasias at the Old Frankfort Cemetery, where the majority of hypoplasias occurred between 2.0 and 4.5 years of age (King 2007). This date is consistent with a weaning period in early childhood and with data reported by other researchers (Allen et al. 1987; Corruccini et al. 1985; Goodman 1988; Goodman et al. 1984; Goodman et. al. 1987; Powell 1988). Many of these researchers have concluded that this peak in hypoplasias is associated with stresses associated with weaning (Corrucini et al. 1985; Goodman et al. 1987). Although weaning is a gradual shift from breast feeding to solid foods (Danforth 1989), it is considered to be the most dramatic transition of childhood (Corruccini et al. 1985) and likely has strong influence on the presence and occurrence of hypoplastic defects. In all likelihood the other hypoplasias noted in the Eastern State Hospital population also occurred during early childhood.

Table 18. Estimates of Age (in years) at Onset of Hypoplasias for Burial 7.

Tooth	Estimated Age in Years
Maxilla	
C	4.83
I2	3.47
I1	1.85
Mandible	
C	2.77
I2	1.19
I1	1.30

CONCLUSIONS

An examination of their teeth suggests that all of the individuals recovered from Eastern State Hospital are of European descent. The presence of Carabelli's trait on the maxillary molars of eight individuals supports this suggestion. That Burial 7 had shovel-shaped incisors, suggests that this individual also may have had some Native American heritage.

Wear patterns observed in the Eastern State Hospital population appear typical for a historic population that primarily consumed foods with a moderate amount of grit. Of interest was the high mandibular wear patterns noted for several individuals. The cause of higher than expected wear mandibular wear patterns at Eastern State Hospital may indicate that some of the individuals consumed more foods that contained grit than others interred at Eastern State Hospital or it could be due to bruxism or the grinding or tapping of the teeth, either when asleep or unconsciously while awake, or some other as yet unidentified cultural practice.

The pattern of wear found in the maxillae from Eastern State Hospital is similar to the maxillary dental wear at the Old Frankfort Cemetery. At the latter, most individuals (93.9 percent) had low wear or moderate wear scores, with only a small amount (6.1 percent) having high wear scores, compared to 8 percent of the maxillary teeth at the Old Frankfort Cemetery. However, the Eastern State Hospital population has much higher mandibular wear scores, than those found at the Old Frankfort Cemetery. This differential wear could be attributed to some patients at Eastern State Hospital using their teeth as tools for some activity. It is also possible that the small sample size from Eastern State Hospital is responsible for the appearance of heavier mandibular wear and that it does not represent intercemetery cultural differences.

That 73 percent of the individuals recovered from Eastern State Hospital had one or more carious lesions, suggests that they probably consumed a diet high in cariogenic foods that included sugars and sticky, starchy foods. Only two of the individuals from Eastern State Hospital had one or more abscess.

There is general acceptance that the frequency of hypoplasias may provide an indication of general health status of a population (Goodman et al. 1984). The high prevalence of enamel defects, with seven of the 11 individuals showing one or more hypoplasia, indicates the individuals recovered from this site were exposed of malnutrition during childhood.

The peak age at occurrence of enamel defects for Burial 7 is similar to that found in other studies of both prehistoric and historic populations. The dentition suitable for calculations has an average age at onset of 2.56 years. Numerous researchers have attributed hypoplasias in this age to the stresses associated with weaning and the transition from breast milk to solid foods. These findings are consistent with the occurrence of hypoplasias at the Old Frankfort Cemetery. Both populations have high prevalence of enamel defects indicating that individuals interred within these cemeteries lived under less than desirable conditions and were exposed to chronic malnutrition and/or disease.

BURIALS INVESTIGATED

GRAVE SHAFTS

Ten of the 11 burials documented at the Eastern State Hospital site (15Fa289) were found approximately 1.8 m below ground surface, in a large grave shaft that measured approximately 1.5 x 7 m (Figures 15 and 16). The eleventh burial was located at a depth of approximately 2.15 m below ground surface in a grave shaft that predated the mass burial. It measured 49 cm x 1.85 m. Sometime after the mass grave shaft had been backfilled, demolition debris was deposited over these graves. Later a paved road was constructed in this locality, and a gas line was placed above the northwestern edge of the mass grave and the individual grave shaft. The gas line was documented at a depth of about 1 m below ground surface (Figure 16).

A backhoe was used to remove 1.5 m of overburden and to define the limits of the large grave shaft. Once the grave shaft had been photographed and mapped (Figures 16 and 17), each individual grave was excavated. The soil within the large grave shaft and the individual grave shaft consisted of a gray to brown silty clay loam. Coffin outlines were demarcated by nails and screws. The subsoil consisted of a reddish-brown consolidated clay.

BURIAL 1

This grave was located approximately 1.5 m below ground surface in the northeast wall of the backhoe trench for a new waterline, and approximately 28 cm north of Burial 2 (Figures 16 and 17). Unfortunately, most of the remains associated with this burial were disturbed by the backhoe, and the remains that were not, were very wet and friable. As determined from the position of the remaining bones, the body was oriented with the head to the north-west.

Coffin Remains and Hardware

The remains of a hexagonal coffin were identified along the left side of the grave after the overburden was removed. Only five cut nails, which date from 1830 to 1880, were recovered in association with this burial. Undoubtedly some of the nails recovered from the back dirt pile probably were part of the coffin associated with this burial.

Human Remains

Most of the skeletal remains from Burial 1 were commingled with Burial 2 when both were disturbed by the backhoe. The commingled remains were separated in the laboratory. Burial 2's cranium was very badly damaged, and most of the postcranial bones suffered moderate to severe damage. This individual is probably a male, and an older adult, aged 60+ years. Among the teeth recovered were the mandibular and maxillary central incisors.

Figure 15. View of Mass Burial Shaft Looking Northeast (Note Location of Backhoe Trench and Gas Pipeline). The Mass Grave Shaft extended about 40 cm to the northeast.

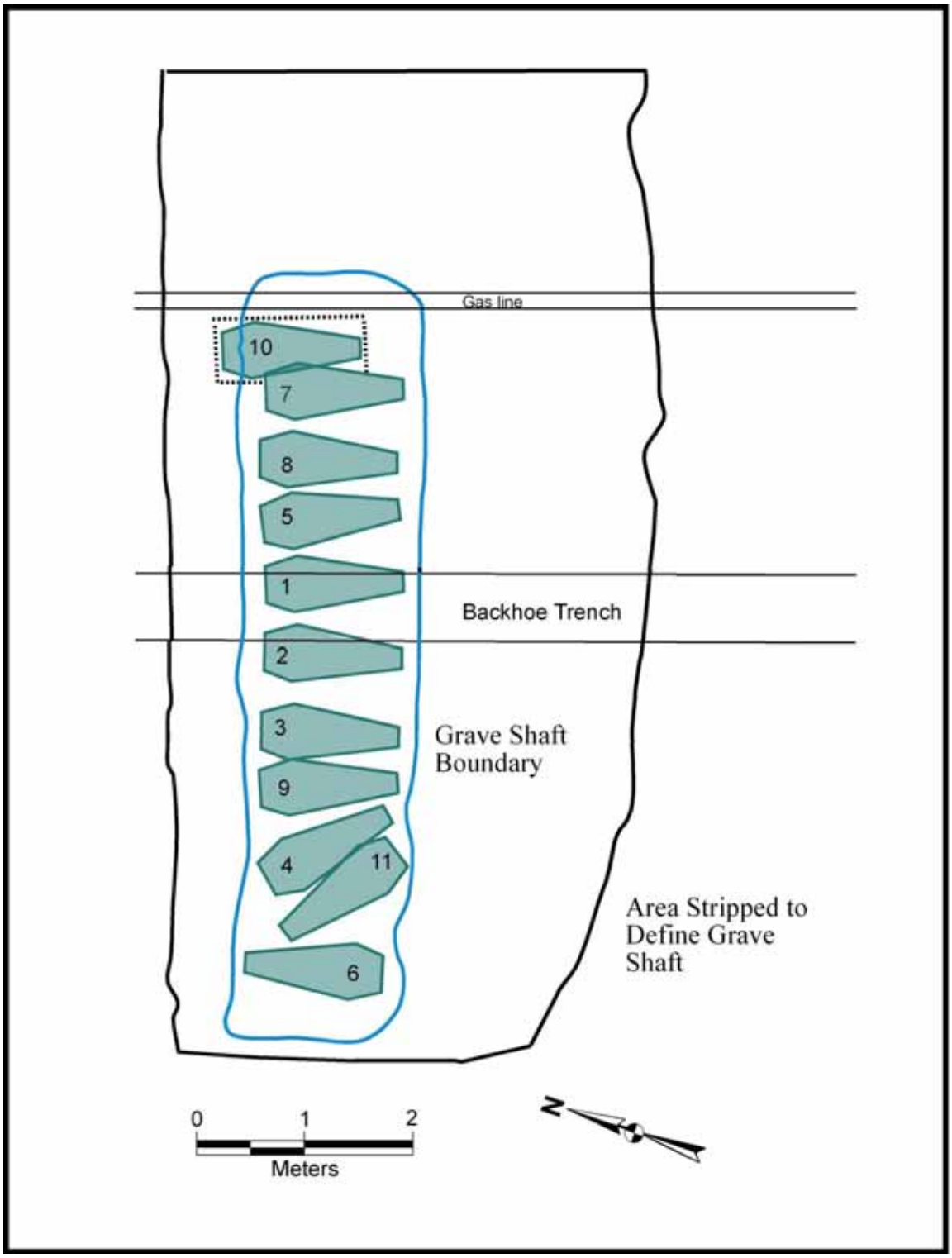

Figure 16. Planview of Eastern State Hospital Burials.

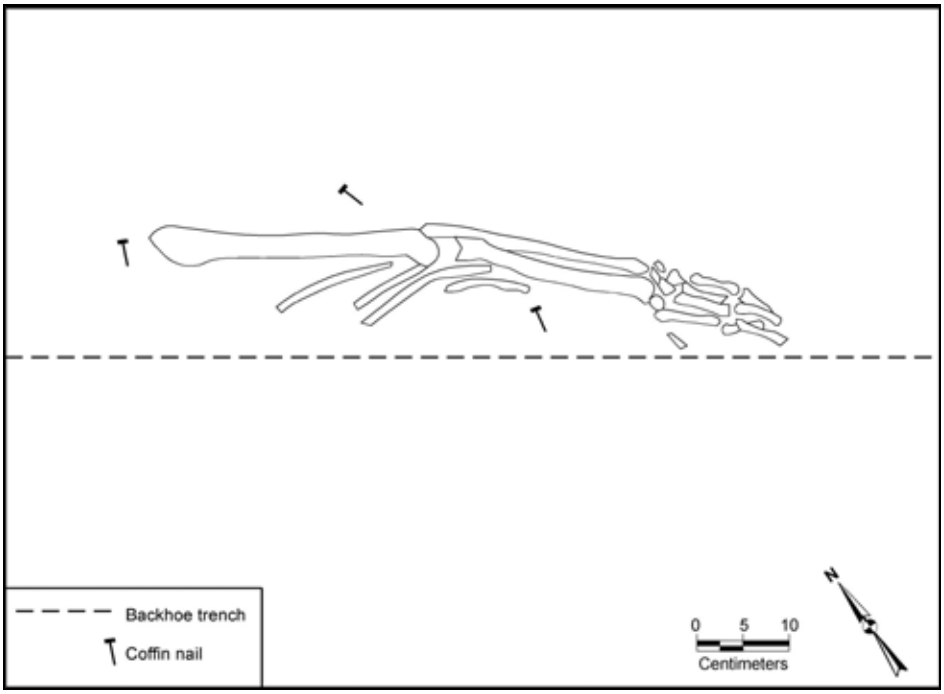

Figure 17. Planview of Burial 1 (Most of this individual was disturbed by the Backhoe.)

Analysis of the skeletal remains indicated this male undertook a great deal of heavy labor during the course of his life, including work that was performed while kneeling. This is evidenced by woven bone deposition and expansion of the cortical bone on the anterior crest of the tibiae, and woven bone deposition on the backs of the calcanea, as a result of arthritis in both areas. Burials 1 exhibited bowing of the left and right humeri, radii, and ulnae, and clearly appears to have suffered from Rickets, a childhood disorder that is a result of a lack of vitamin D, calcium, or phosphate.

Dental remains were limited due to heavy damage to the burial. All of the teeth associated with this individual were recovered from the backhoe backdirt pile. The central incisors from the maxilla and mandible, and the upper left first molar were the only teeth recovered. The incisors showed heavy wear, while the molar had a low to moderate wear. The observed incidences of heavy wear could be attributed to processes other than chewing food with moderate amounts of grit, such as bruxism, or some other cultural practice. No cavities or abscesses were observed. The maxillary teeth had moderate calculus formation, while the mandibular teeth had mild calculus. One hypoplasia was observed on the upper left first molar, but due to attrition, age at onset could not be calculated.

Personal Artifacts

No personal artifacts were recovered from Burial 1.

BURIAL 2

This burial was located in the south wall of the backhoe trench, directly south-west of Burial 1 (Figures 16 and 18). The dark outline of the coffin was visible in the surrounding matrix.

Coffin Remains and Hardware

The remains of a hexagonal coffin that measured 2.0 m in length (Figure 18) was documented in association with Burial 2. The coffin's width could not be determined due to the damage from the backhoe trench. A total of 33 cut nails was recovered along the outline of the coffin. Though its outline was visible in the surrounding matrix, no wood from the coffin was recovered.

Human Remains

Most of the left side of the body, including the shoulder, hand, arm, pelvis, and femur, and portions of the left ribs, tibia, fibula, and skull were removed by the backhoe. As was previously mentioned, most of these skeletal remains were commingled with those from Burial 1 when both were disturbed by the backhoe. The commingled remains were separated in the laboratory.

Burial 2 is that of an older adult (age 60+ years) male based on the narrowness of the right greater sciatic notch of the pelvis, and an overall large body size. He stood about five feet, eight inches tall and suffered some arthritis, as evidenced by lipping and woven bone deposition on the neck of the right femur. The anterior crests of both tibiae exhibited woven bone and cancellous expansion, possibly indicating heavy labor performed while kneeling. This individual had indications of heavy muscle attachments on the humeri and femora, which also is indicative of one having performed heavy labor. As with Burial 1, this individual exhibited bowing of the left and right humeri, radii, and ulnae. While Burial 2 also may have suffered from Rickets, the longbone pathologies associated with this male could not be associated with this disorder with the same degree of confidence. Thus, it is possible that his abnormally shaped longbones were caused by other as yet unidentified vitamin deficiencies.

Dental remains included most of the teeth, although they were not in occlusion. None of the teeth associated with this individual exhibited heavy dental wear. Of the eight teeth that had cavities, six were classified as root caries and two were scored as interproximal (between the teeth). A majority of the teeth present also had enamel hypoplasias (growth lines that reflect nutritional stress between 0 and 4 years of age). The presence of these hypoplasias indicates that this individual experienced some stoppage of growth due to malnutrition between birth and four years of age.

Personal Artifacts

No personal artifacts were recovered from Burial 2. Brick and limestone fragments found near the body do not appear to be associated with any type of mortuary structure (Figure 18). Rather they represent architectural materials that were part of the grave shaft fill.

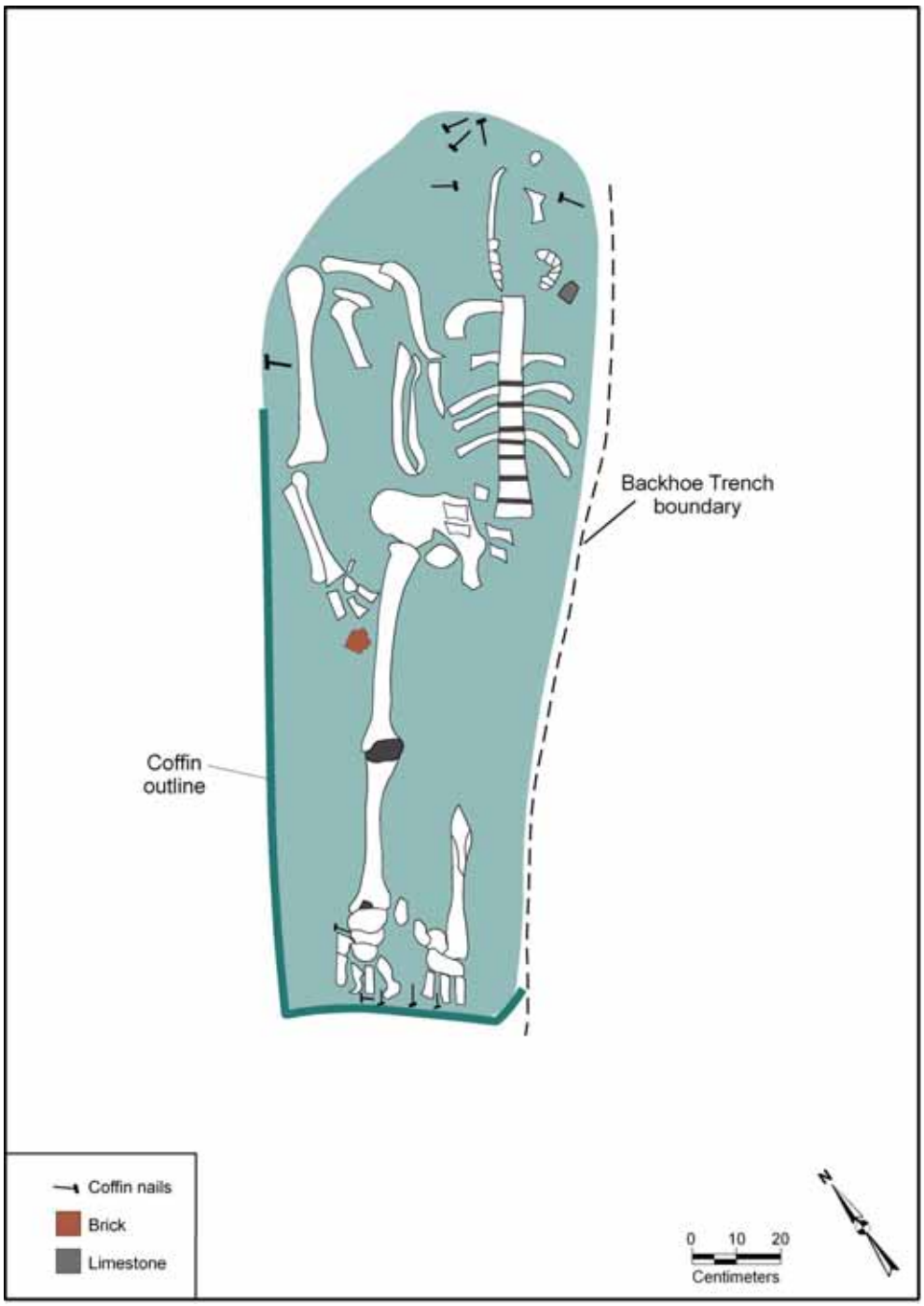

Figure 18. Planview of Burial 2 (Right side of the body was Disturbed by Backhoe Trench).

BURIAL 3

Burial 3 was located approximately 20 cm to the southwest of Burial 2 (Figures 16 and 19). This burial was oriented northwest to southeast, with the head toward the northwest. The arms of this individual had been positioned along the sides of the body.

Coffin Remains and Hardware

The remains of a hexagonal coffin that measured 2.0 m in length and 58 cm in width were documented in association with Burial 3 (Figure 19). A total of 41 cut nails was recovered along the outline of the coffin. Though its outline was visible in the surrounding matrix, no wood from the coffin was recovered.

Human Remains

While the longbones from Burial 3 initially appeared to be in relatively good condition, when the bones were removed they broke into small fragments and none could be reconstructed in the laboratory. Thus, this individual's sex identification as female is based only on landmarks associated with her skull. This woman was an old adult (60+ years) who stood approximately five feet, five inches tall. She suffered from arthritis in the knees and ankles, as evidenced by lipping on the distal epiphyses of the femora and proximal epiphyses of the tibiae. In addition, both tibiae have woven bone deposition and cancellous expansion with callous formation possibly indicating that she performed heavy labor while kneeling. Burials 3 exhibited narrowing of the humeri, radii, and ulnae diaphyses, and twisted or bowed longbone shafts. While this individual may have suffered from Rickets, it is possible that her abnormally shaped longbones were caused by other as yet unidentified vitamin deficiencies.

The dentition is in moderately good shape; despite the fact that several teeth have lost enamel due to weathering and taphonomic processes. Most of this individual's teeth exhibited moderate wear, with the two lower left premolars and two of the three lower left molars exhibiting heavy wear. Overall this woman's dental wear is consistent with a diet that contained a moderate amount of grit. Although her teeth exhibit 16 enamel hypoplasias, age at onset could not be calculated due to dental wear. The multiple hypoplasias observed indicate she suffered multiple bouts of malnutrition in early childhood. Carabelli's trait was observed on both upper first molars, indicating this woman was of European descent.

Personal Artifacts

One Prosser button, dating to 1840 or later was recovered from near the right shoulder (Figure 19). This suggests this individual was wearing clothing when her body was placed in the coffin. Based on the location of this button and the varied location of buttons from other burials it is likely that this woman was interred in street clothing rather than a standardized uniform.

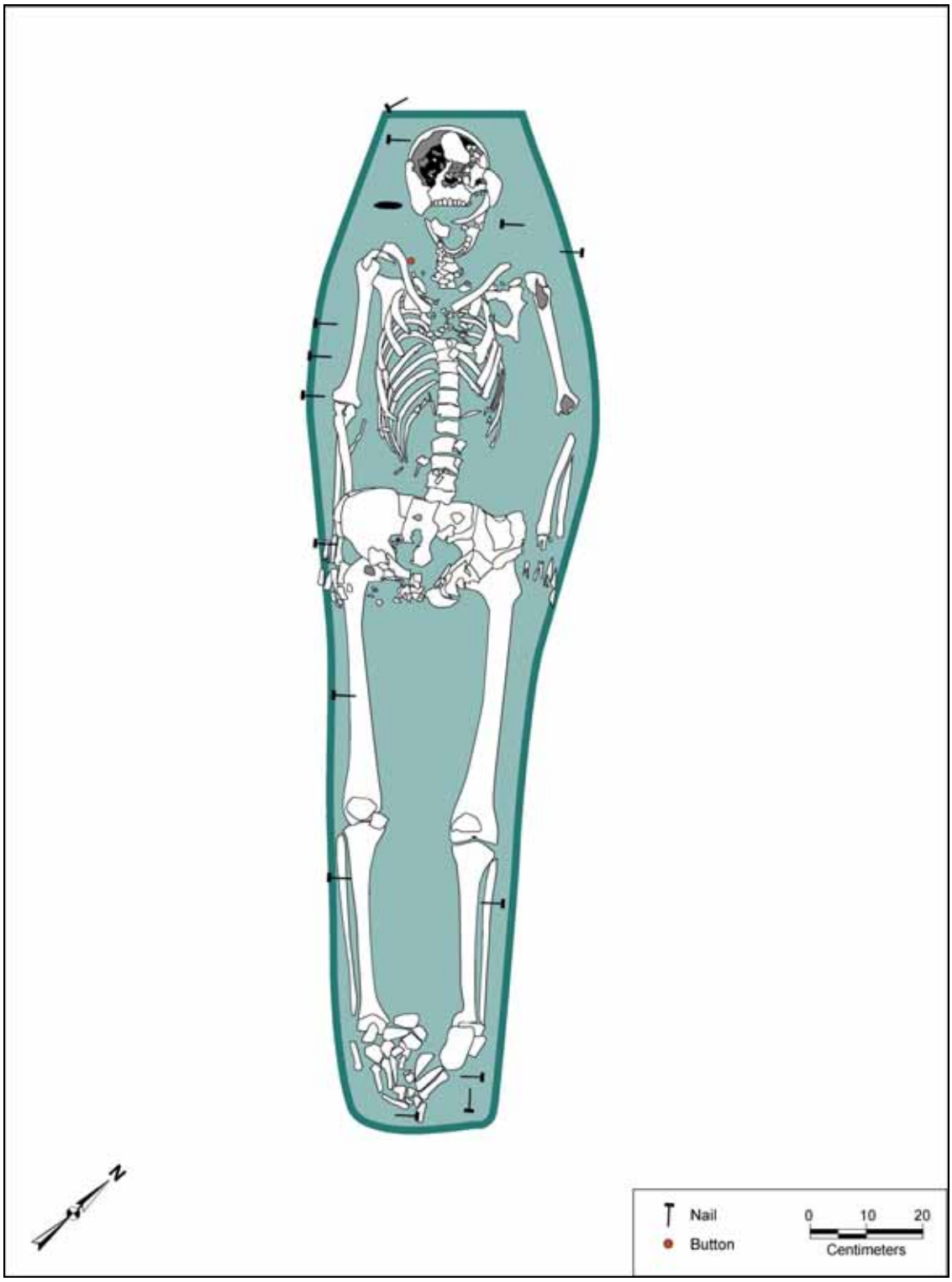

Figure 19. Planview of Burial 3.

BURIAL 4

Burial 4 was located approximately 90 cm southwest of Burial 3, with Burial 9 being situated between them. This individual's coffin was placed at a 135 degree angle to the rest of the burials (Figure 16). This angle is actually closer to a magnetic east to west orientation than the other burials. The head of this individual's was oriented towards the west. While the left arm of Burial 4 was positioned along side the body, the right arm was flexed so that hand was resting near the chin (Figure 20).

Coffin Remains and Hardware

The remains of the hexagonal coffin that measured 1.90 m in length and 56 cm in width (Figure 20) was documented in association with Burial 4. A total of 28 cut nails, was recovered along the outline of the coffin. Though its outline was visible in the surrounding matrix, no wood from the coffin was recovered.

Human Remains

Burial 4 is 60+ years old female, who stood approximately five feet, eight inches tall. This woman also suffered from arthritis (woven bone deposition in the knee joint complex), and shows the effects of performing some form of labor while kneeling (woven bone deposition and callous formation on the anterior crests of the tibiae). There also was evidence of arthritis in the shoulders with woven bone deposition on the clavicles. As with Burial 3, this individual exhibited narrowing of the humeri, radii, and ulnae diaphyses, and twisted or bowed longbone shafts. While she may have suffered from Rickets, it is possible that her abnormally shaped longbones were caused by other as yet unidentified vitamin deficiencies.

The mandible and maxilla were very badly damaged, and the dental roots that were recovered were the result of severe carious decay, which points to a diet that primarily consisted of sweet and sticky, starchy foods. Of the teeth that were recovered most exhibited heavy wear. Carabelli's trait was observable on the upper left first molar, indicating this woman is of European descent. The extreme carious decay did not allow for the examination of enamel hypoplasias.

Personal Artifacts

One Prosser button dating to 1840 or later was recovered from this burial as was one piece of window glass (1.5 mm thick). The button was located in the upper thoracic vertebrae (Figure 20), while the window glass was recovered from the grave shaft fill. Based on the location of this button and the varied location of buttons associated with other burials it is likely that this woman was interred in street clothing rather than a standardized uniform. The window glass fragment does not appear to have been part of the coffin. As such, its proximity to the osteological remains suggests the grave shaft fill included a small amount of building debris from a nearby structure.

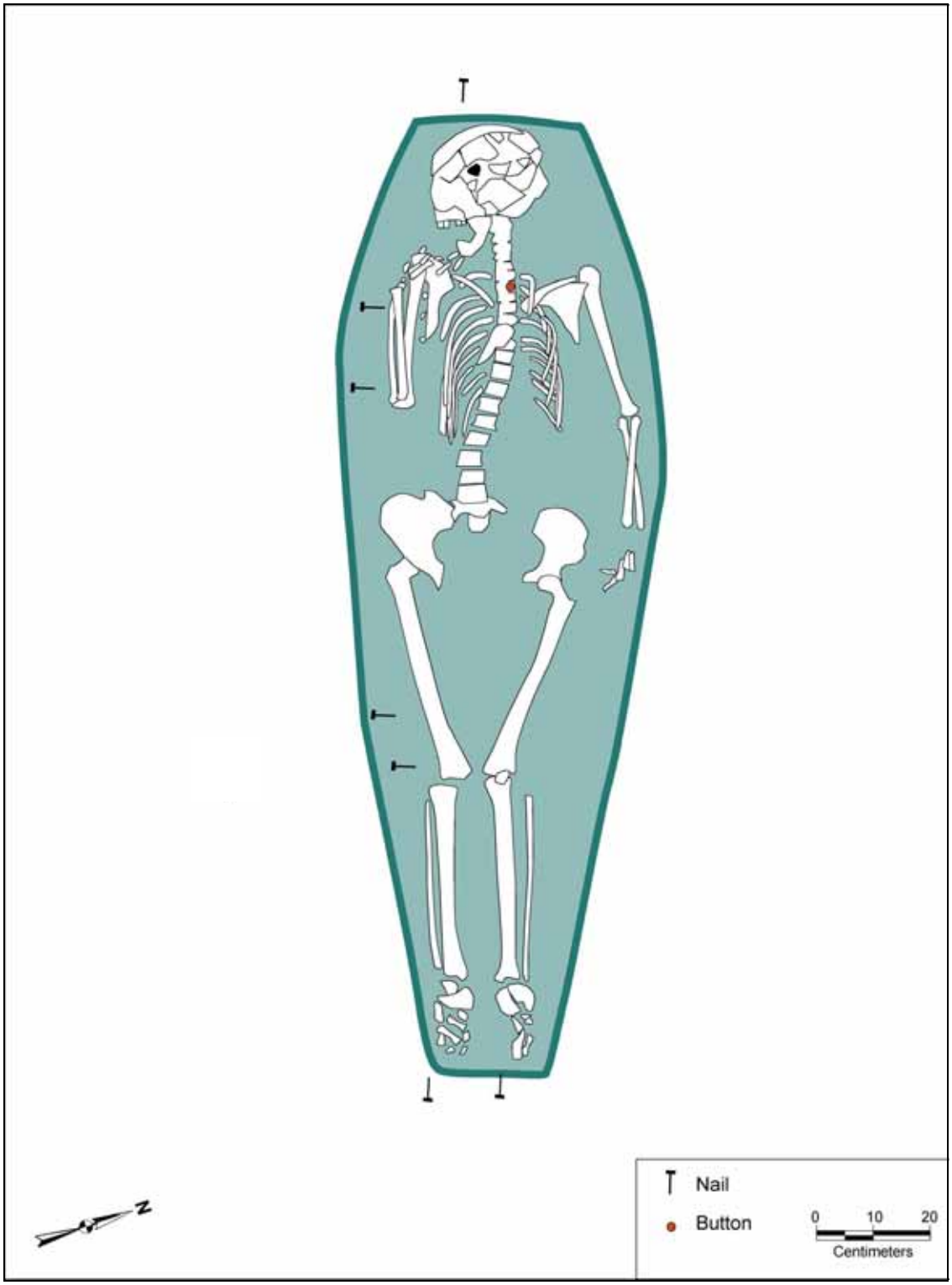

Figure 20. Planview of Burial 4.

BURIAL 5

This burial was located to the northeast of and adjacent to Burial 1 (Figures 16 and 21). The head of this individual was oriented towards the northwest. The arms of this individual had been positioned along the sides of the body, with the hands resting on the pelvis.

Coffin Remains and Hardware

The remains of a narrow hexagonal coffin that measured 1.79 m in length and 39 cm in width was documented in association with Burial 5 (Figure 21). A total of 28 cut nails was recovered along the outline of the coffin. Though its outline was visible in the surrounding matrix, no wood from the coffin was recovered.

Human Remains

Burial 5 is a male with an estimated age of 50 to 59 years old, placing him in the old adult category. The stature of this male was approximately five feet nine inches tall. This burial also exhibited arthritis in the knees and ankles based on woven bone deposition in the joint complexes. Woven bone deposition and callous formation on the anterior crest of the tibiae, indicates this individual performed some form of heavy labor, perhaps while kneeling. Burials 5 exhibited narrowing of the humeri, radii, ulnae, femuri, and fibulaes diaphyses, and twisted or bowed longbone shafts. While he may have suffered from Rickets, it is possible that her abnormally shaped longbones were caused by other as yet unidentified vitamin deficiencies.

Many of the teeth associated with this individual exhibited heavy wear and loss of enamel. The heavy wear patterns point to diet that contained a moderate amount of grit. Carabelli's trait was observed on the upper right third molar, indicating this male was of European descent. While 14 enamel defects are identified on the molars and central mandibular incisors, including hypoplasias and diffuse boundary opacities, age at onset for these insults could not be calculated due to heavy wear. Multiple hypoplasias per tooth indicate this individual experienced several episodes of malnutrition during in early childhood.

Personal Artifacts

One piece of window glass (1.7 mm) was recovered from the grave shaft fill. The window glass fragment does not appear to have been part of the coffin. As such, its proximity to the osteological remains suggests the grave shaft fill contained a small amount of building debris from a nearby structure.

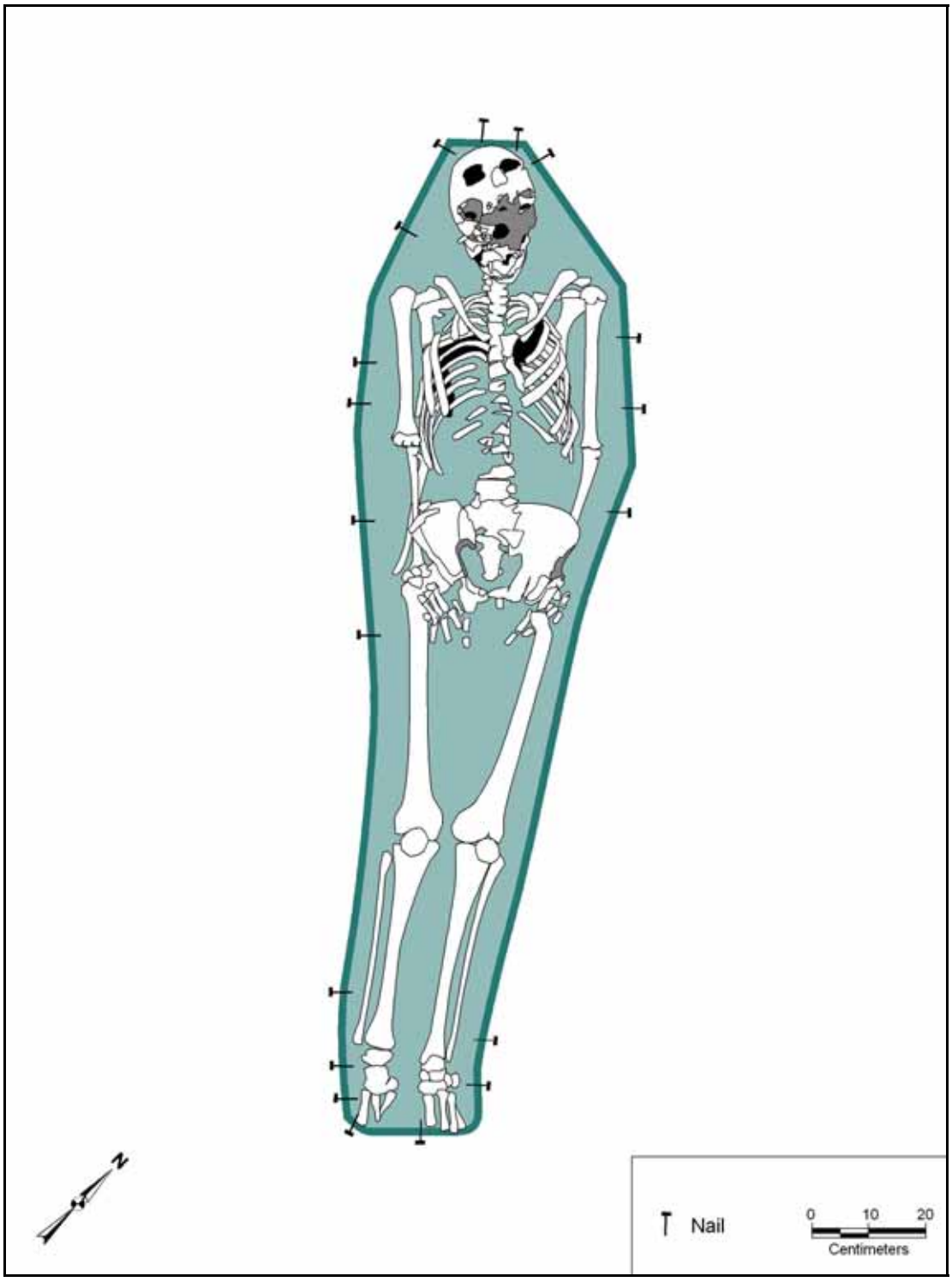

Figure 21. Planview of Burial 5.

BURIAL 6

This grave was located approximately 25 to 30 cm northeast of the southwestern end of the large grave shaft and about 50 cm southwest of Burial 4 (Figures 16 and 22). It was oriented northwest to southeast, however, unlike most of the burials whose head was oriented towards the northwest; this burial's head was oriented towards the southeast. The upper arms of this individual had been positioned along the side of the body, with the lower arms and hands laid across the chest.

Coffin Remains and Hardware

The remains of a hexagonal coffin that measured 1.96 m in length and 60 cm in width (Figure 22) was documented in association with Burial 6. A total of 42 cut nails demarcated the outline of the coffin. Though its outline was visible in the surrounding matrix, no wood from the coffin was recovered.

Human Remains

Burial 6 was in poor condition with many of the bones reduced to a powdery consistency. Because of the taphonomic damage, a specific age can not be assigned to this individual. Based on general large body size and the length of the longbones, this individual was classified as a male. He stood approximately six feet, one inch tall, making him the tallest person in this burial population.

Only two pathologies were observed due to the fragmentary nature of the remains: a narrowing of the diaphyses of the humeri, radii and ulnae, and woven bone deposition on the posterior surface of the calcanea. The narrowed longbone shafts may be indicative of a deficiency in vitamin D or calcium. While he may have suffered from Rickets, it is possible that his abnormally shaped longbones were caused by other as yet unidentified vitamin deficiencies. The woven bone on the backs of the heels points to arthritis in the rear portion of the ankle and heel.

Very few teeth were recovered with this burial, and those that were, were moderately worn or too badly damaged for further analysis. Moderate dental wear and severe carious decay indicates this individual consumed sweet and sticky, starchy foods that contained a moderate amount of grit.

Personal Artifacts

Two Prosser buttons were recovered from the lower chest area, one near the left wrist and one near the right elbow (Figure 22). Based on the location of these two buttons, and taking into consideration the varied location of buttons associated with other burials at Eastern State Hospital, it is quite likely that this individual was interred in street clothing rather than a standardized uniform.

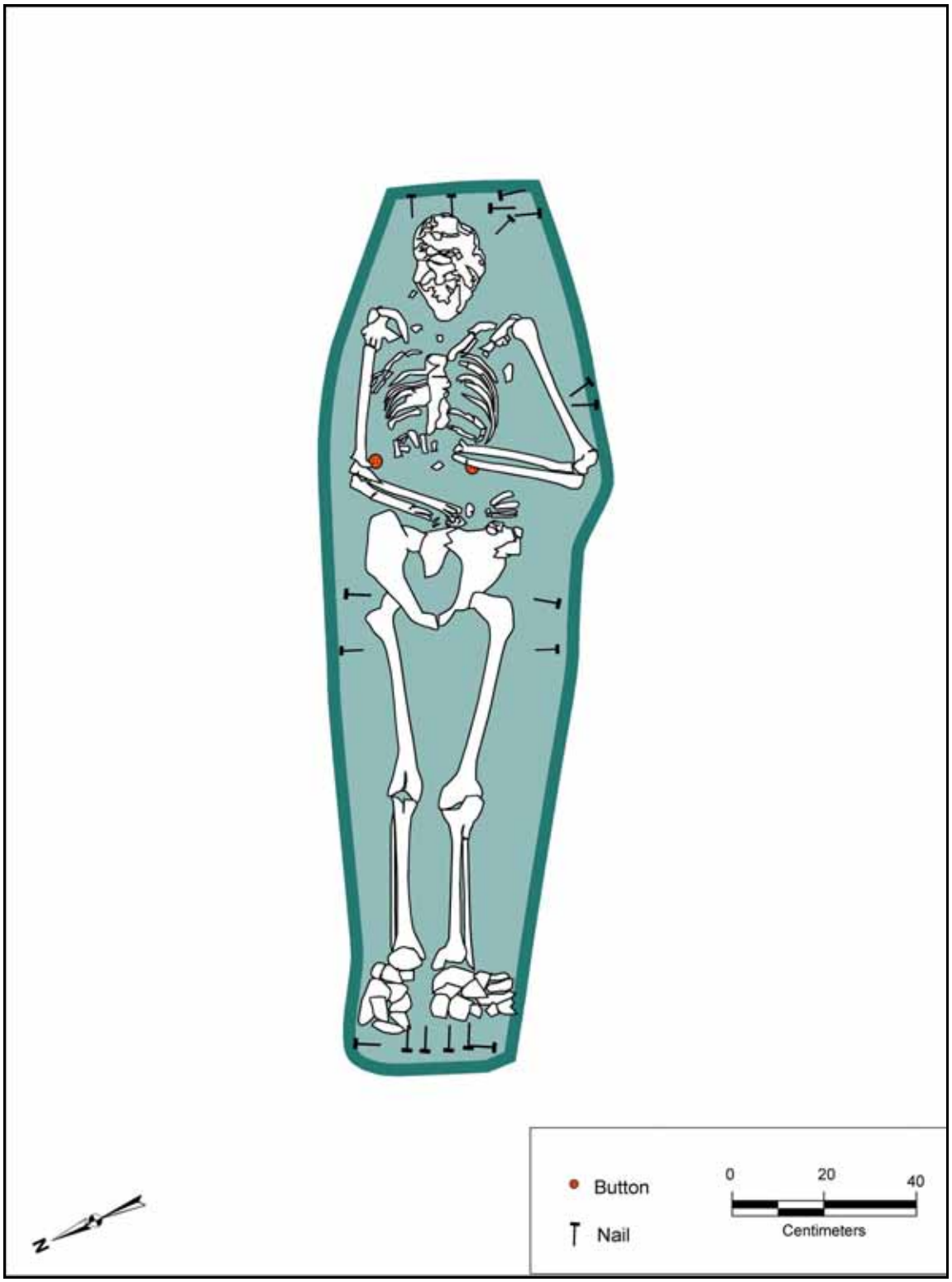

Figure 22. Planview of Burial 6.

BURIAL 7

Burial 7 was located approximately 15 cm northeast of Burial 8 (Figures 16 and 23). It also overlaid a portion of Burial 10's grave shaft. This individual was oriented northwest to southeast, with the head to the northwest. While both upper arms had been placed along the side of the body, variation was noted in the placement of the lower arms, with the lower right arm and hand being placed along the side of the body, and the lower left arm and hand being placed across the chest (Figure 23).

Coffin Remains and Hardware

The remains of a hexagonal coffin that measured 1.65 m in length and 44 cm in width (Figure 23) was documented in association with Burial 7. A total of 31 cut nails was recovered along the outline of the coffin. Though its outline was visible in the surrounding matrix, no wood from the coffin was recovered.

Human Remains

While Burial 7 initially appeared to be in relatively good condition, when the bones were removed they quickly began to disintegrate. This individual is a female age 35-45 years old, with a stature of approximately five feet two inches. She suffered from vitamin deficiency as evidenced by bowing of the shafts of both of the humeri, femuri, and fibulaes. While she may have suffered from Rickets, it is possible that her abnormally shaped longbones were caused by other as yet unidentified vitamin deficiencies. There also is evidence of arthritis, including woven bone deposition on the femora and callous formation of the anterior crests of the tibiae. Both are usually indicative of physical activities that involve a great deal of kneeling.

This individual provided the best dental data. All of the teeth were present except for the upper right third molar. Dental wear was low; most teeth were scored "1." This individual's young age relative to the rest of the burial population likely contributed to the lower observed dental wear. Though she exhibited less wear, it is quite likely that this woman had the same diet as the other individuals recovered from Eastern State Hospital: one that primarily consisted of sweet and sticky, starchy foods that contained a moderate amount of grit.

This individual had shovel-shaped incisors and Carabelli's trait, indicating she had a mixed Native American and European heritage. One cavity was observed on the upper left third molar, and was on the occlusal surface of this tooth. A total of 20 hypoplasias was observed, which allowed for calculation of age at onset for the hypoplasias. Through a series of regression formulae, the age at onset ranged between 1.19 years and 4.83 years, with the average being 2.56 years of age.

Personal Artifacts

Five pieces of window glass (1.64 mm average thickness) were recovered from the grave shaft fill in the vicinity of this burial. These window glass fragments do not appear to have been part of the coffin. As such, their proximity to the osteological remains suggests the grave shaft fill included a small amount of building debris from a nearby structure.

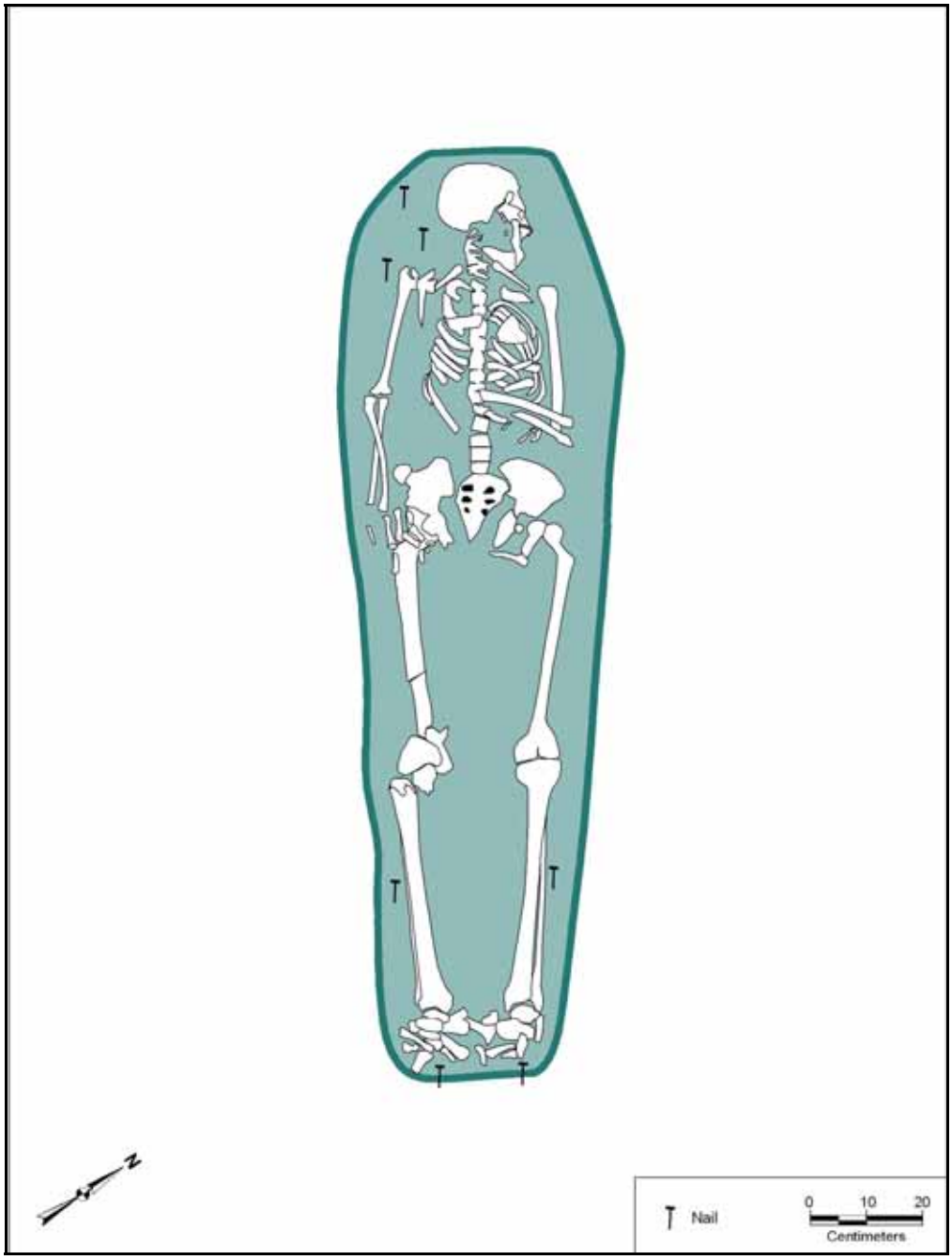

Figure 23. Planview of Burial 7.

BURIAL 8

This burial was located directly to the northeast of Burial 5, and directly to the southwest of Burial 7. The head of this individual was oriented to the northwest (Figures 16 and 24). While the left arm of Burial 8 was positioned along side the body, the right arm was flexed so that the hand was resting near the chin (Figure 25).

Coffin Remains and Hardware

The remains of a hexagonal coffin that measured 1.76 m in length and 49 cm in width (Figure 24) was documented in association with Burial 8. A total of 24 cut nails was recovered along the outline of the coffin. The outline was visible in the surrounding matrix, but there were no remains of the wood from the coffin.

Human Remains

Burial 8 is a female with an estimated age of 60+ years, or old adult. Her stature was approximately four feet, eleven inches, short even for the mid-nineteenth century. This individual suffered from arthritis, as evidenced by woven bone deposition and coarsening of the articular surfaces of the clavicles, and woven bone deposition and callous formation on the anterior crests of the tibiae. The latter indicates this individual performed heavy work while kneeling.

The maxilla and mandible were badly damaged due to taphonomic processes. While none of this woman's maxillary teeth were recovered, all of her mandibular teeth were available for analysis. Most of her teeth exhibited moderate wear, with her lower right first and second premolars and canine exhibiting low wear. Overall this individual's dental wear reflects a diet with a moderate amount of grit in the food.

Personal Artifacts

Three four-hole bone buttons were found in a line along the spinal column, possibly indicating this individual was wearing a button-down shirt (Figure 24). These types of buttons, which were very common during the nineteenth century, were made from animal bone.

One piece of window glass also was recovered from the grave shaft fill and a fragment of an olive container glass was recovered from next to the left tibia (Figure 24). The window glass fragment, which had a thickness of 1.6 mm, does not appear to have been part of the coffin. Nor does the container glass fragment appear to have been intentionally placed with this individual. As such, their proximity to the osteological remains suggests the grave shaft fill included a small amount of building debris and domestic artifacts from a nearby structure.

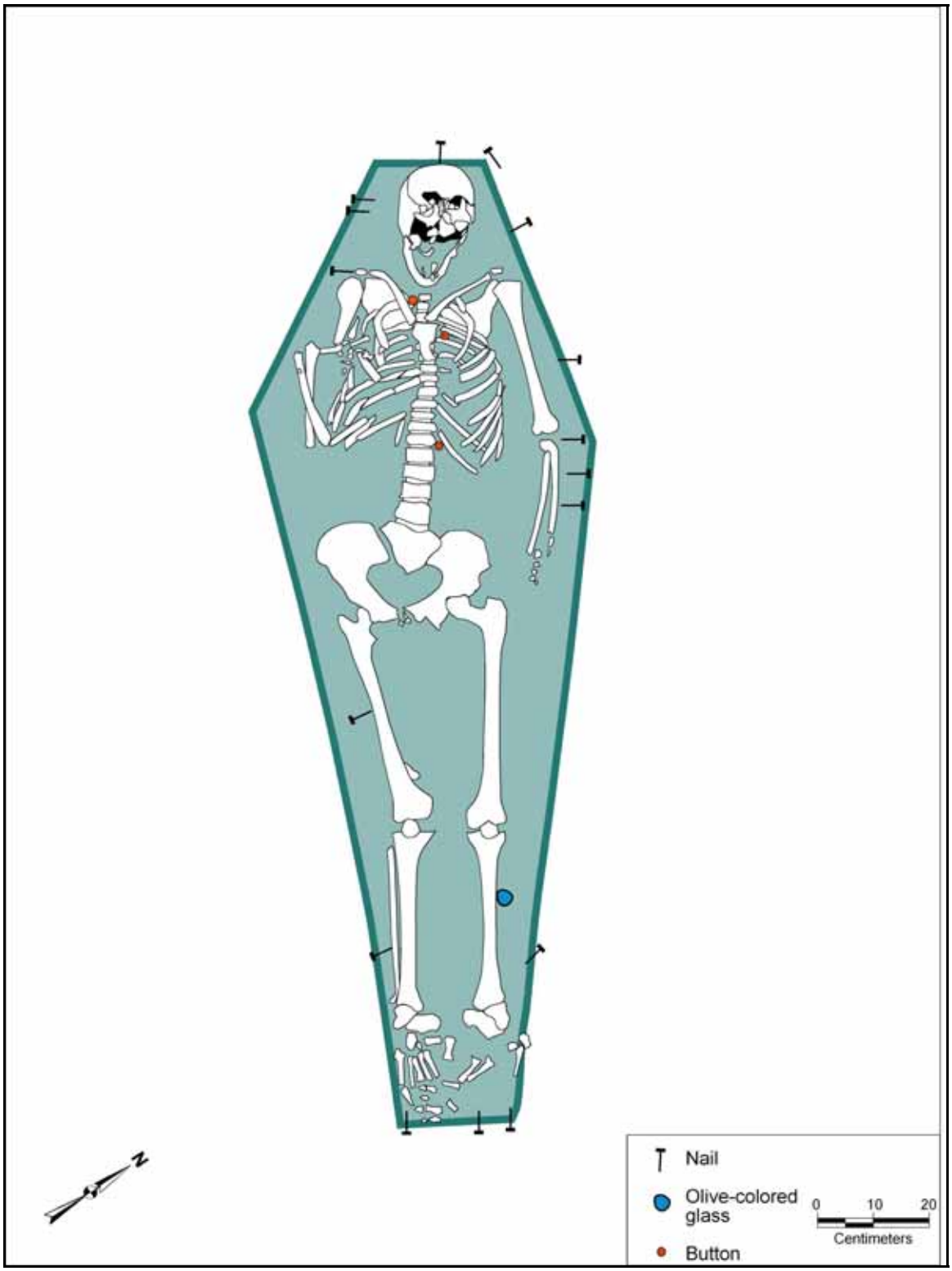

Figure 24. Planview of Burial 8.

BURIAL 9

This burial was located approximately 1.40 m southeast of Burial 1, between Burials 3 and 4 (Figures 16 and 25). The head of this individual was oriented to the northwest. While the upper portion of the left arm of Burial 8 was positioned along side the body with the lower arm placed across the chest, the right arm was flexed so that the hand was resting near the chin (Figure 25).

Coffin Remains and Hardware

The remains of a hexagonal coffin that measured 1.17 m in length and 40 cm in width (Figure 25) were documented in association with Burial 9. A total of 37 cut nails was recovered along the outline of the coffin. Though its outline was visible in the surrounding matrix, no wood from the coffin was recovered. The nine cast iron fragments found in association with Burial 9, may be the remains of a name plate. It is also quite possible that they are unidentifiable fragments of an iron artifact that was part of the original grave shaft fill.

Human Remains

Burial 9 is a 35-50 year old male who stood about five feet six inches. This individual was badly damaged due to taphonomic processes. Arthritis is evident in the form of woven bone and callous formation on the anterior crests of the tibiae. When considered with indications of heavy musculature and large tendon insertions, the presence of the woven bone and callous formation suggests this individual performed heavy labor, perhaps while kneeling. This individual also suffered a completely healed, facture of the fibula.

The maxilla and mandible were badly damaged by taphonomic processes. Only the upper right second premolar and the lower right first and second incisors were recovered. These teeth had moderate wear, and a cavity was noted on the interproximal surface of the premolar. Because the dental remains were badly damaged, or missing, they could not be analyzed for enamel defects.

Personal Artifacts

No personal artifacts were found in association with Burial 9. Two pieces of window glass (1.45 mm average thickness) were recovered from near the human remains. The window glass fragments do not appear to have been part of the coffin. As such, their proximity to the osteological remains suggests the grave shaft fill may have included a small amount of building debris from a nearby structure

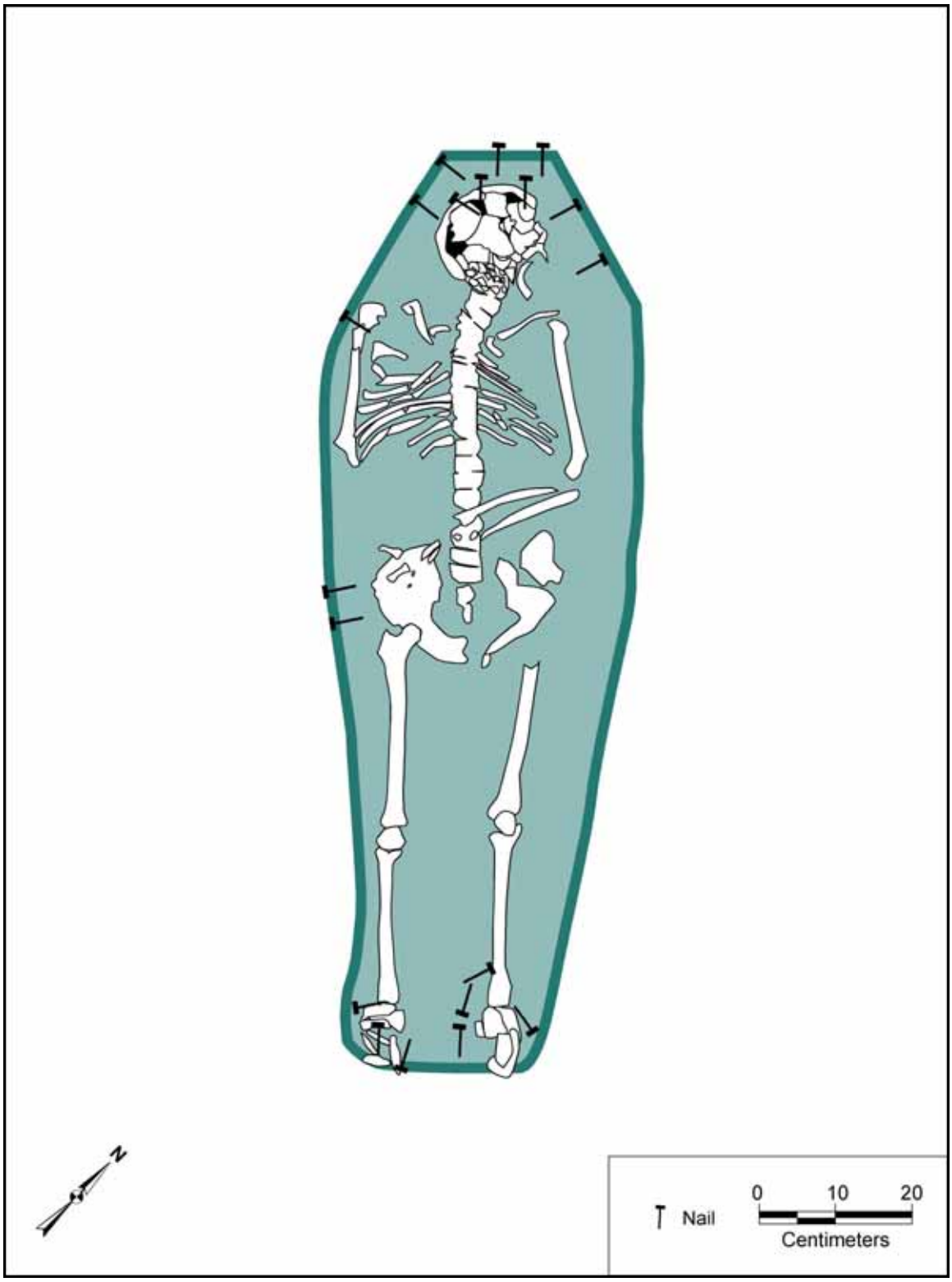

Figure 25. Planview of Burial 9.

BURIAL 10

Burial 10 was interred in a single grave shaft that was overlain by the large multiple burial shaft (Figures 16 and 26). The right radius of this individual was located approximately 35 cm below the left shoulder and head of Burial 7. That the multiple grave shaft overlays Burial 10 coupled with the depth of this burial and the fact its grave shaft extends further to the northwest than the multiple grave shaft, indicates that this burial predates the mass burials (Burials 1-9 and 11). This grave was oriented northwest to southeast, with the head to the northwest (Figure 26). The upper arms of this individual had been positioned along the side of the body with the lower arms and hands laid across the pelvis.

Coffin Remains and Hardware

The remains of a hexagonal coffin that measured 1.85 m in length and 49 cm in width (Figure 26) were documented in association with Burial 10. A total of 60 cut nails, demarcated the outline of the coffin. Though its outline was visible in the surrounding matrix, no wood from the coffin was recovered. A much larger number of coffin nails were recovered from Burial 10 than any of the other burials, with around 30 coffin nails being the most common. The larger number of nails used to construct this coffin suggests that more care may have been taken to construct it than was used in the manufacturing of the other coffins. The latter may have been mass produced to accommodate the large number of individuals placed in the multiple grave.

Human Remains

Burial 10 is a female, with an estimated age of 50-59 years. Her stature is estimated to be five feet eight inches. Her cranial vault and facial bones are significantly narrowed, lending to a pinched facial appearance. This is probably the result of a congenital condition, possibly pituitary dwarfism or ‘congenital idiot.’ This condition probably resulted in some degree of mental retardation.

This individual also exhibited evidence of a shoulder injury that had healed. At some time during her life her right shoulder may have been dislocated. The injury would have weakened the joint. This coupled with heavy labor would have led to an arthritic reaction in the joint surfaces that produced lipping and extensive woven bone deposition, and eburnation, or polishing of the bone resulting from rubbing against another bone, present on the humeral head and glenoid fossa of the scapula.

The patellae and tibiae exhibit woven bone and callous formation on the anterior crests, and the presence of heavy musculature and large tendon insertions indicates this individual performed heavy labor. In addition, there is evidence of a vitamin deficiency, such as vitamin D or calcium, in the form of narrowing of the shafts of the tibiae.

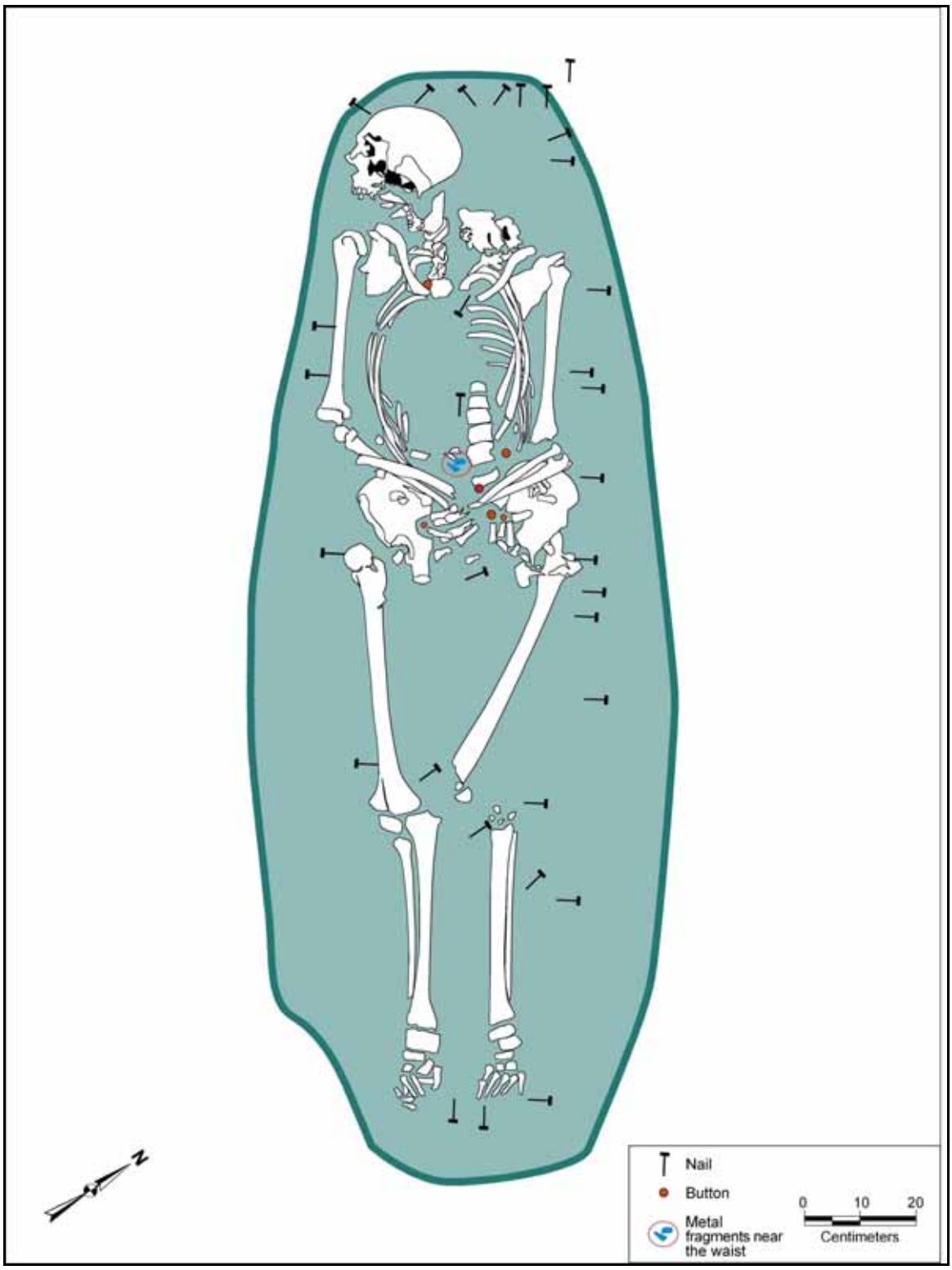

Figure 26. Planview of Burial 10.

While most of the Burial 10's teeth exhibited moderate dental wear, three mandibular teeth exhibited heavy wear and two had low wear. It addition to tooth wear, a large abscess was present on the left side of the maxilla in the area of the first and second molars. The second molar had deteriorated to the point that only the root was present. The third molar had been lost in life, resulting in heavy resorption of the alveolar bone. The presence of Carabelli's trait on the upper right third molar indicating this individual was of European descent. The upper left third molar was too badly damaged to observe this trait. Although 16 hypoplasias were observed on the remaining teeth, age at onset could not be calculated due to the heavy wear. The multiple hypoplasias observed indicate she suffered multiple bouts of malnutrition in early childhood.

Personal Artifacts

A cast iron buckle was recovered from the waist of this individual (Figure 26). Though the buckle was fragmented and heavily concreted, it may have been part of a skirt or belt. Seven bone buttons (three large 4-holed and four small 5-holed) also were recovered from this burial (Figure 26). The buttons were recovered from the wrist and neck areas suggesting this individual was wearing a shirt with a collar and buttoned cuffs. As with the extra care given to the construction of her coffin, this individual was interred with more personal items than the other burials, which also points to more attention being given to the treatment of her body.

BURIAL 11

This burial was located directly southwest of Burial 4, and directly northeast of Burial 6 (Figures 16 and 27). This individual was oriented east-west, with the head towards the east. It appears that Burial 11 and Burial 4 were placed at an 135 degrees angle relative to the other coffins in the mass grave in order to fit it all of the coffins in one large grave shaft. While the upper portion of the right arm of Burial 11 was positioned along side the body with the lower arm placed across the chest, the left arm was flexed so that hand was resting near the chin (Figure 27).

Coffin Remains and Hardware

The remains of a hexagonal coffin that measured 2 m in length and 55 cm in width (Figure 27) was documented in association with Burial 11. A total of 31 cut nails, demarcated the outline of the coffin. Though the outline was visible in the surrounding matrix, no remains of the wood from the coffin were recovered.

Human Remains

Burial 11 is a female, with an estimated age of 40 to 50 years. Her estimated stature is five feet seven inches. Due to severe taphonomic damage the only observable pathology was on the vertebrae. Mild Schmorl's nodes, and elevated rings were observed on several of the thoracic vertebra bodies, indicating this individual suffered from arthritis.

Dental remains show moderate to heavy wear on all the teeth indicating this individual consumed a diet with a moderate amount of grit. The observed incidences of heavy wear could be attributed to processes other than chewing food with moderate amounts of grit, such as bruxism. Three cavities of the interproximal surfaces were observed on the upper right third molar and upper right premolars. Carabelli's trait was observed on the upper right third molar indicating this individual was of European descent. No hypoplasias were observed on the teeth due to the heavy wear.

Personal Artifacts

Three Prosser buttons were recovered from the area of the neck. The location of these buttons is suggestive of a collared shirt or nightgown. One piece of window glass (1.1 mm) and one fragment of a whiteware (dating to post 1830) ceramic vessel were recovered in close proximity to this burial. The window glass was recovered from the area of the greater trochanter on the left femur and the whiteware fragment was recovered from the hip area (Figure 28). The window glass fragment does not appear to have been part of the coffin. Nor does the whiteware fragment appear to have been intentionally placed with this individual. As such, their proximity to the osteological remains suggests the grave shaft fill may have included a small amount of building debris and domestic artifacts from a nearby structure.

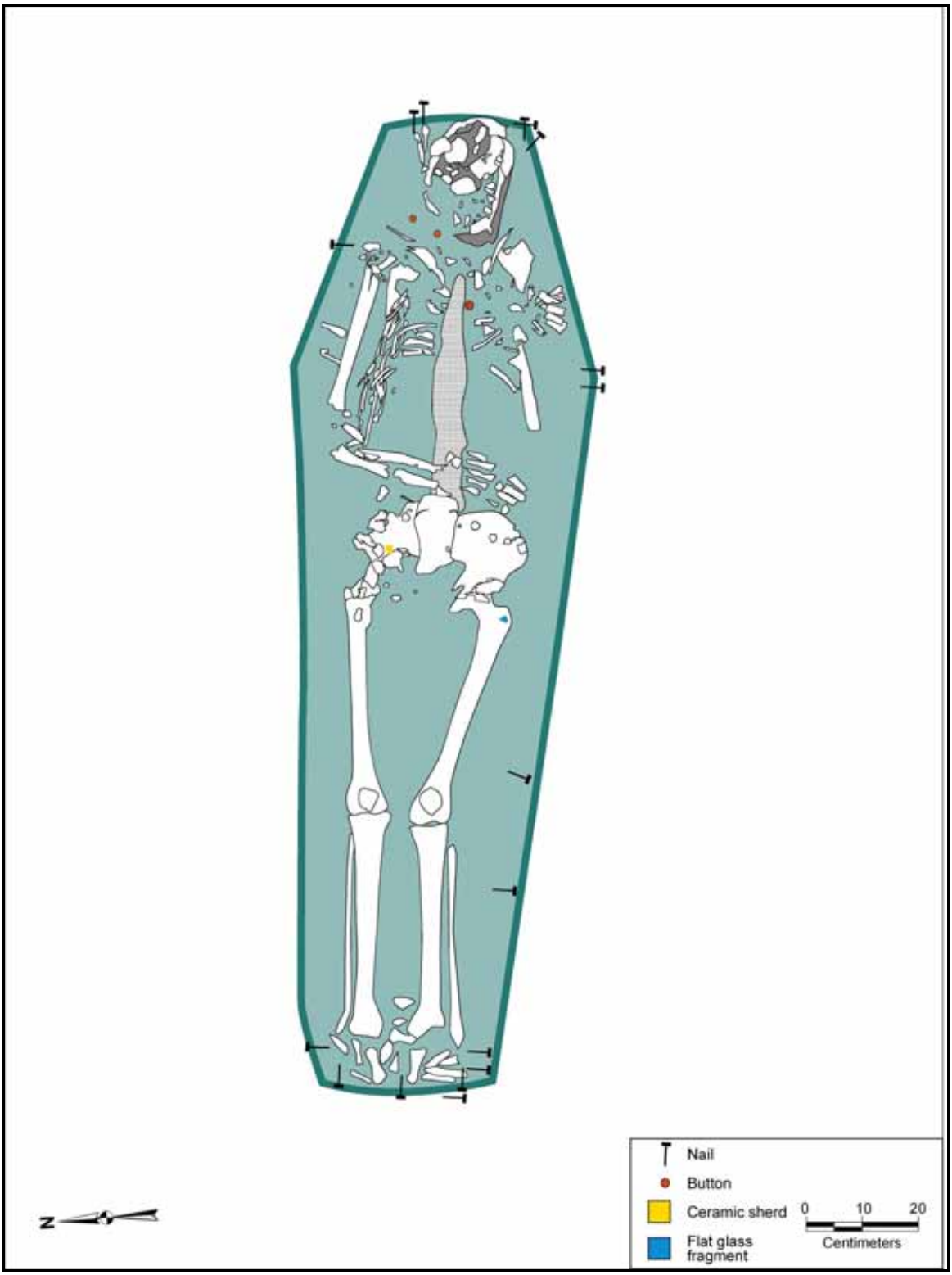

Figure 27. Planview of Burial 11.

SUMMARY

Of the 11 burials excavated at Eastern State Hospital 10 were recovered from a mass grave and one (Burial 10) was recovered from a smaller pit that predates the mass grave. The shaft for the mass burials was oriented northeast to southwest, with most of the graves oriented with their oriented heads pointing towards the northwest (Figure 17). Three burials situated on the southwestern edge of the grave shaft exhibited a different orientation. The head of Burial 4 was oriented towards the west, Burial 6's head was oriented towards the southeast, and the head of Burial 11 was oriented towards the east. These burials may have been oriented in this manner in order to accommodate all of the coffins in the space provided by the grave shaft. Burial 10 had the same orientation as the majority of the individuals interred in the large grave shaft.

Each person was buried in a hexagonal, wooden coffin. These types of coffins were the norm up until the mid-1800s, when they were replaced by four-sided coffins. All of the coffin nails were machine-cut and were manufactured sometime between 1830 and 1880. Almost all of the personal items associated with these individuals were four or five hole bone buttons, which date from the early to mid-nineteenth century, or porcelain Prosser buttons, which date from after 1840. Based on the shape of the coffin, the nails used in their construction, and the presence of the Prosser buttons all of these individuals appear to have died in the mid-1800s.

Support for this suggestion comes from the archival record, which indicates that by 1861 the area where the mass grave was found was part of the "pleasure grounds" for female inmates. The review of these records also indicated that it is located on or near the northern boundary of a parcel acquired in 1939 and the northeastern edge a parcel acquired in 1854. Thus, map and deed evidence suggest that the mass grave dates no earlier than 1839 and no later than 1861.

Its location below the mass burial pit indicates that Burial 10 predates the burials placed in this pit. Based on the previously mentioned archival data it also post-dates 1839. The larger number of nails used to construct the coffin this individual was placed in coupled with Burial 10 being placed in a separate pit and having more personal artifacts associated with it, suggests that greater attention was paid to the interment of this individual than was given to those who were placed in the mass burial pit.

Variation in the location of the Prosser and bone buttons recovered from the graves of seven individuals suggests these they were not wearing standardized uniforms. For instance, Burial 8 may have been wearing a button-down shirt as reflected by the three buttons found in a line along the vertebral column, while Burial 10 may have been wearing a shirt with a collar and buttoned cuffs as reflected by the buttons noted at the wrist and neck areas of this individual. In contrast to these two burials, the buttons found in the area of the neck of Burial 11 are suggestive of a collared shirt or perhaps a nightgown. Based on the variation in the location of the buttons recovered from burials at Eastern State Hospital it would appear that these individuals were interred in different

types of clothing. Perhaps they were interred in clothing provided by their relatives, that had been donated to the hospital, or that they made themselves.

Not only was variation observed in the types of clothing people were interred in, but in how they were placed in their coffin. While all of the burials were extended, differences were noted in how the arms were positioned. Generally, in historic burials the upper arms are laid along the side of the rib cage, with lower arms and hands crossed over the pelvis or the chest, or laid along side the body. While five of the burials (3, 5, 6, 7, and 10) conform to this pattern, four (Burials 4, 8, 9, and 11) did not (the other two burials were two disturbed to determine how the arms had been positioned). When these four individuals were placed in their respective coffins, the right (n=3) or left (n=1) arm was bent with the hand resting by the chin. A similar placement of the right arm was observed on two of the five Mexican War veteran burials documented at the State Mound in Frankfort (Stottman and Pollack 2005). These burials also date to the mid-nineteenth century. It is possible that the positioning of primarily the right hand by the chin was a mid-nineteenth century mortuary custom. In contrast to the Eastern State Hospital and State Mound burial populations this pattern was rarely observed at the Old Frankfort Cemetery (David Pollack, personal communication 2006). The latter dates from ca. 1800 to the 1850s, and contains a high percentage of African-Americans. Whether the observed differences in the placement of the right or left hand are related to temporal trends or ethnicity remains to be determined.

All of the burials were adults, who were over 35 years of age at death. The most common pathological conditions observed were related to arthritis, especially involving the knee joints. One individual (Burial 10) had severe arthritis in the right shoulder, related to a dislocation of that joint. This individual also exhibited deformation of the cranial vault related to a congenital disorder.

Remodeling of the anterior crests of the tibiae indicates that most of these individuals performed heavy labor while kneeling for prolonged periods of time. Additional evidence that these individuals performed heavy labor is reflected by enlarged longbone muscle attachments. While all of these individuals suffered from a number of physical aliments and non-identifiable infections, overall their health appears to be that of hard working people who lived during the mid-nineteenth century.

Only seven individuals had dentition suitable for observation of dental enamel hypoplasias, and calculation of age at onset could only be determined for Burial 7. The age at onset for this individual was 2.56 years. This age is consistent with an occurrence of hypoplasias associated with weaning. It is expected that the other individuals recovered from Eastern State Hospital would have had similar ages at onset. Overall the dentition of this population points to individuals who that consumed sweet and sticky, starchy foods that contained moderate amounts of grit and that were highly cariogenic.

CONCLUSIONS

A total of 11 individuals was recovered from the excavation of a mass grave and a single interment at Eastern State Hospital. Ten of the 11 individuals were buried in the mass grave, which suggests that they were all buried at the same time. Based on an examination of the archival records pertaining to Eastern State Hospital it appears that these individuals were buried some time between 1839 and 1861. A review of these records indicates that they had been interred along the northern boundary of a parcel acquired in 1839 and adjacent to the northeastern edge of a parcel of land acquired by the hospital in 1854. By 1861 this area was being used for inmate recreation. A date range of 1839 to 1861 is supported by the types of coffins they were interred in, the materials used to construct the coffins, and the personal artifacts associated with these individuals. All of these individuals were interred in six-sided (hexagonal) wood coffins that were constructed with late machine-cut nails. Six-sided coffins were the norm in America until the mid-nineteenth century, and late machine-cut nails were manufactured from 1830 to 1880. Finally, the Prosser buttons recovered from several graves were not manufactured until the 1840s.

Between 1839 and 1861 the death rate at Eastern State Hospital exceeded 10 every year except for 1844 (n=8), 1845 (n=10), 1859 (n=9), and 1860 (n=0). Perhaps more significantly, a Cholera epidemic struck Lexington and the asylum in 1849-1850, with 215 patients died during these two years. Perhaps the 10 individuals interred within the mass grave died during this Cholera epidemic. Alternatively, they may have died during the winter when the ground was too frozen to excavate graves. Their bodies may have been were stored in the stone vault built for that purpose in 1843, with burial taking place in the spring.

Both older men and women of European descent were interred in the mass grave, with all over 35 years of age when they died. All had experienced a life of hard work based on enlarged longbone muscle attachments. The skeletal analysis did not provide conclusive evidence of any specific pathogens that may have caused the death of any of the individuals. Though it has been suggested that these individuals were victims of the 1849-1850 Cholera epidemic, unfortunately, Cholera, which can be fatal in two to three hours when no treatment is administered, or 18 hours to several days with minimal treatment, leaves no distinguishing markers on the skeleton.

One female (Burial 10) had skeletal evidence of a congenital disorder that probably led to some state of mental retardation; however, medical and psychological diagnoses of the nineteenth century may have determined that this individual suffered from some other mental defect that would not have left skeletal evidence. As previously noted the death of this individual preceded those interred in the mass grave. This individual also was distinguished from the other burials by the greater attention paid to the construction of her coffin and the larger number of personal artifacts found in association with her skeletal remains.

As at the Old Frankfort Cemetery, more than 70 percent of the individuals recovered from Eastern State Hospital had carious lesions. The presence of numerous caries indicates these individuals consumed a diet high in cariogenic foods that included sugars and sticky, starchy foods.

Dental wear patterns observed in this population are indicative of individuals who consumed foods with a moderate amount of grit. While maxillary wear patterns observed in the Eastern State Hospital population were similar to those at the Old Frankfort Cemetery, the Eastern State Hospital population had higher than expected mandibular wear patterns. This may reflect differences in the diets between the resident of Lexington and Frankfort, or it could be attributed to some patients at Eastern State Hospital using their teeth as tools for some activity. Overall, the high incidence of caries and high wear scores indicates that this population did not enjoy good dental health.

Hypoplasias were observed on the dentition of almost two-thirds of the burial population, which indicates that most of the individuals interred at Eastern State Hospital experienced periods of nutritional stress during childhood. The peak age of occurrence of enamel defects for was 2.56 years. This is consistent with what has been documented for other prehistoric and historic populations, such at the Old Frankfort Cemetery, where there is a peak in occurrence of enamel hypoplasias between 2 and 4 years of age. Numerous researchers have attributed this peak to the stresses associated with weaning and the transition from breast milk to solid foods

The archaeological investigations conducted at Eastern Sate Hospital have contributed to our understanding of nineteenth century health and mortuary practices. Considering the history of the site and where these remains were discovered, the potential of finding additional burials in this portion of the hospital grounds is high. Therefore, in advance of any ground disturbing activities it is recommended that Eastern State Hospital contact the Kentucky Heritage Council to determine the nature and extent of additional studies that may be required.

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